

The Iron Age

INDEX TO
READING MATTER,
PAGE 30

A Review of the Hardware, Iron and Metal Trades.

INDEX TO
ADVERTISEMENTS
PAGE 17

Published every Thursday Morning by DAVID WILLIAMS, Nos. 66 and 68 Duane Street, New York. Entered at the Post Office, New York, as Second-Class Matter.

Vol. XXXVII: No. 25.

New York, Thursday, June 24, 1886.

\$2.50 a Year, Including Postage.
Single Copies, Ten Cents.

The Estrade High-Speed Locomotive.

In an article on "Novelties in Locomotive Practice," published in our issue of May 27, 1886, we referred among other matters to an engine designed by Mr. Estrade, a graduate of l'Ecole Polytechnique, and which, as stated at the time, was to be tried on the Southern lines in France. Mr. Estrade's designs covered a complete system of rolling stock for a passenger train, and were exhibited in model form at the Conservatoire des Arts et Métiers, at Paris. The locomotive, we are now informed, has just been completed at the establishment of MM. J. Boulet & Co., of Paris, and we take pleasure in presenting this week an engraving of it, for which we are indebted to *Le Génie Civil*.

For the benefit of those of our readers who may not have access to the issue of

body of the car is supported. The coach is separated into two stories, the lower of which is made in three pendent sections, with doors, which may be used as baggage-rooms, &c. Above is a single compartment with central passageway, reached by stairways at each end of the coach, and communicating with the other portions of the train by hinged platforms.

The trials which M. Estrade proposes to make at an early date will be watched with much interest.

The Bursting of Fly-Wheels.*

The bursting of fly-wheels of rolling-mill engines had become so frequent that in 1833 the Prussian Government authorities directed a searching inquiry to ascertain the cause in detail. The official returns, in-

fly-wheels of the dimensions and in the circumstances reported, and which were actually destroyed; taking three examples, a wheel at the Bärbacher forge, a wheel at Königshütte, a wheel at Witten, and, as a fourth example, the pattern of a wheel frequently adopted in works where no similar disaster has occurred. To these he recurs throughout the essay. All four wheels, although in different localities, were subject to the same stress on the material at about equal circumferential velocities, from which it appears that experience has determined a certain uniformity of practice in proportioning such wheels; moreover, a stress equal to the breaking load, or even to the elastic limit of the material, would only accrue, at much higher velocity than usual, if there was carelessness on the part of the engineer in charge, and it is hardly possible that the three wheels were destroyed by centrifugal

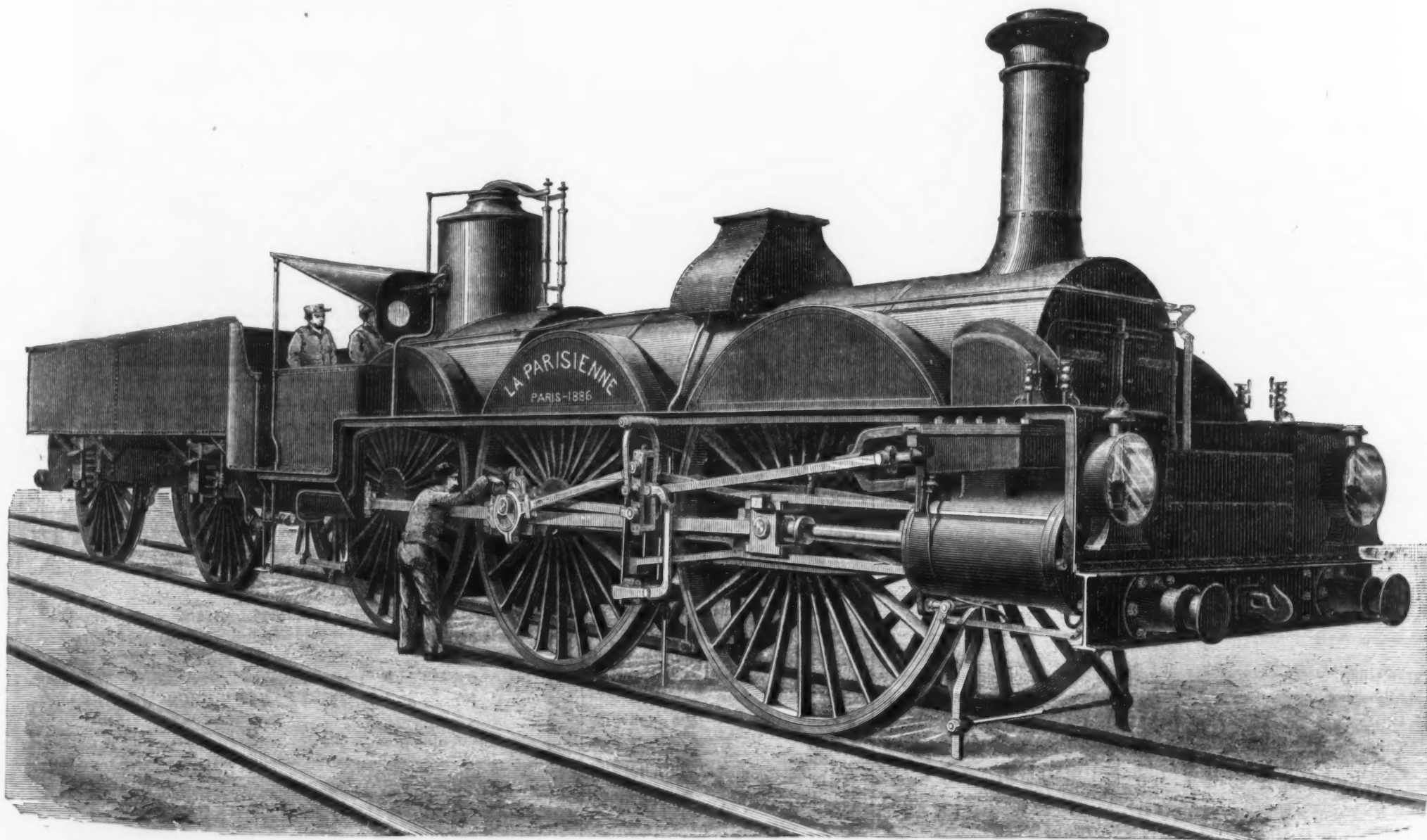
ous than wheels in the particular service he has considered, but they are equally liable to accident if the proportions and details of construction to which he has adverted are improper, or they are allowed to acquire an inordinate velocity. He points out that his calculations do not, on the whole, conflict with the rules of practice, and this he takes as corroboration of accuracy—that fly-wheels of good construction, properly looked after, would not fracture; but it is nevertheless true that wheels have broken up, and there are many now at work in hazardous condition.

He concludes with a series of recommendations. The following are the most noteworthy: The arms should be of wrought iron each, and its attachment of equal strength with the iron rim. The engine should be fitted with a quick-acting governor, driven direct from the shaft; the

erect a water-gas apparatus as an auxiliary for the purpose indicated. Ten per cent. of water gas will add about 3 per cent. of carbonic oxide to the coal gas, making in all, say, 7 per cent., not sufficient to make the gas product especially dangerous.

Structure of Steel.

In a recent discussion before the Iron and Steel Institute Sir Henry Bessemer gave some interesting particulars of an experiment he had made 30 years ago, suggested by observing the difference between French and English lump sugar. The English sugar has a much larger crystal than that made in France, and in the latter the material is cooled quickly and stirred while cooling, while English sugar is allowed to stand and



M ESTRADÉ'S HIGH-SPEED LOCOMOTIVE LA PARISIENNE.—DIAMETER OF DRIVERS, 8¼ FEET.

The *Iron Age* in which we described the engine, we reprint the following particulars: Convinced of the value of large wheels, M. Estrade fits not only his locomotive, but also the tender and coaches, with wheels 8¼ feet in diameter. His locomotive is of the outside cylinder type, with slide-valve on the top of cylinder, and all the gear carried outside, according to the general plan on the Continent. The six wheels of 8¼-foot diameter are coupled and placed as close together as possible, as will be seen from the following table of dimensions, which will be studied with curiosity, if not with interest:

Total length, feet.....	33
Width between longitudinals, feet.....	4
Diameter of wheels, feet.....	8¼
Distance between axles, rear to middle, feet.....	8¼
Distance between axles, middle to leading, feet.....	8¼
..... (diameter, inches).....	18½
Cylinders, stroke, inches.....	27½
..... from axle to axle, feet.....	6½
Grate surface, square feet.....	248
Heating surface, square feet.....	1,408
Capacity of boiler, cubic feet.....	144
Weight of engine, empty, tons.....	38
Weight of engine, loaded, tons.....	42

It is calculated that this engine will be capable of maintaining speeds of 72 to 78 miles an hour. The tender has wheels 8¼ feet in diameter, and is arranged to carry as much water and coal as possible, but otherwise presents no features of novelty. The coaches are peculiar in that they are carried inside iron girders, while the wheels run under the center of the longitudinal seats. Two axles, 16 feet apart, support, through elliptic springs mounted upon the oil-boxes, these longitudinal girders, which have ends curving toward the ground. Each girder carries three other elliptic springs, from which is suspended, by means of iron rods, the lower frame on which the

trusted to the author for examination, are the basis of this essay; the data and probabilities point to the conclusion that only a small proportion of the actual casualties have been scheduled. Grouping 41 accidents, he finds the circumferential velocity of one wheel was 42 m. (137.8 feet), and of the others none exceeded 33 m. (108.27 feet). In only a few instances were the conditions abnormal. He believes, therefore, that a special danger exists in the ordinary employment of rolling-mill engine fly-wheels. No accident was attributed to shocks, to which they are necessarily subject when at work, and the significance of fracture in the arms and in the hub does not appear to have attracted sufficient attention. Accidents fatal to life were few, but buildings and machinery had been seriously damaged or destroyed. He recommends proprietors of works to pay special attention to every detail of these fly-wheels. The disruptive force active in a revolving fly-wheel results from: 1. The static weight; 2. the centrifugal force; 3. the torsion moments due to acceleration or retardation at the axis of ordinary fly-wheels (which are neither pulleys for belts or ropes, and not fitted with toothed gear); 4. the tangential forces acting in a plane perpendicular to a section of the rim in the case of belt, rope or toothed-gear transmission.

Consideration of the static weight at once leads to that of the preponderating centrifugal force developed in the rim and in the arms. Diagrams illustrate the composition of the elementary forces, and a series of equations results in fundamental formulae, which the author applies to a numerical estimate of the stresses which would fracture

force if the joints had the strength due to the dimensions of the arms and the rim. The effect of the position of the rim joint, the mode of construction and shape of the joint of the arms with the rims are particularized in this connection. Fly-wheels (except those which transmit force from their circumference to other pulleys or wheels) are subject to alternating forces at their axes, due to variations in the motive force in the engine and to resistance, the latter in the nature of shocks; when iron enters the rolls it is difficult to measure, but it may be sometimes very dangerous. Deformation of the rim occurs when the angular motion is retarded; the greatest centrifugal load is then at the junction of the arms with the rim. The greatest stress on the arms is at the hub, but they are usually tapered, preserving at least uniformity of strength. A dovetailed wedge-shaped junction of the arm and rim tends to turn about one of its angles, and in course of time to work loose and strain the cheeks. Any form of attachment is more or less open to the same objection, but the strength of the rim is not much reduced in consequence. The author advocates the use of wrought iron for the material of the arms.

No particulars are to hand which would enable him to calculate the effect of sudden retardation at the rim of belt and toothed-gear fly-wheels; he proposes to deal with the subject in a separate essay, premising that such wheels are usually made considerably heavier than ordinary fly-wheels, that the conditions in which they work are much more favorable to resist shocks, and that they should be preferred, provided the construction and fitting, which necessitate greater precision, are altogether satisfactory. Ordinary fly-wheels are more numer-

intervention of a friction pulley or belt would be objectionable. The work at the rolls must be conducted with circumspection. If a wheel is suddenly brought up, or its velocity greatly checked, fracture may be expected. It must in this event, before it is set in motion, be minutely examined to ascertain whether it is intact. A competent engineer, or the proprietor himself, should examine the fly-wheels periodically. Avoidance of all forms and modes of construction which might create strains in those parts which are loaded when at work, whether the wheels are built up or cast in a single piece. Many fractures may be attributed to the employment of solid hubs, which are subject to initial strain from the casting. Official and managing engineers are expected to avail themselves of the calculations and information submitted for the critical examination of wheels at work, not only as a matter of interest, but as tending to avoid accidents which otherwise, he anticipates, might sooner or later occur.

At a special meeting of the Boston Society of Civil Engineers Mr. Fred. Brooks, a member, presented a paper on the comparative size of metric and old units, with reference to convenience. This is published in pamphlet form by the Association of Engineering Societies, together with the report of the Committee on Weights and Measures of the Boston Society.

In his presidential address before the ninth annual convention of the Western Gas Association Mr. James Somerville, of Indianapolis, Ind., suggested that every gas company whose managers find difficulty in disposing of their coke at a fair price to

crystallize slowly. Sugar candy stands for days while it is in process of crystallization, the operation being retarded by the application of heat. In this case the crystals are very bold and pronounced. It is also known that in heavy castings, where the heat is kept in a long time by the mass, large crystals are apt to be formed. The experiment referred to was made in the following manner:

A hole was made in the earth, and this was lined with sand; into this a mold that would produce a spherical casting was placed. Between the mold and the sand a quantity of charcoal was packed. The mold then had a quantity of malleable iron made by the Bessemer process poured into it, and the whole was covered up for 10 days. The metal had a heavy dose of phosphorus, ¼ to ½ per cent. but no carbon. At the end of the 10 days the globular mass was dug out. A smart tap with a 2-pound hammer had the effect of sending off a shower of crystals, and there appeared to be no cohesion among the particles of the mass. On hammering one of the crystals on an anvil it could be flattened down, thus showing that each individual crystal was a particle of malleable iron, although the cohesion of the crystals to each other was so slight. Sir Henry thought this experiment worth detailing, as it tended to show the great importance of the time allowed for cooling in iron and steel.

The Swedish Government, following the example of the German Commercial Geography Society, has sent a frigate, the *Vanadis*, to Morocco. The vessel carries, free of charge, samples of the manufactures of about 20 Swedish firms who wish to find a market for their goods in the Mediterranean.

* By — Köchy, from "Foreign Abstracts" of Institution of Civil Engineers.

WESTERN ELECTRIC COMPANY,
227-251 So. Clinton St., Chicago. 70-76 Trinity Place, New York.
COMPLETE AND PERFECT ELECTRIC LIGHTING SYSTEM,
For Central Stations or Isolated Plants. All kinds of Electrical
Apparatus and Supplies.

O. LINDEMANN & CO.,
MANUFACTURERS OF
Japanned, Brass, Tin
Plated and Wood



BIRD CAGES.

254 PEARL STREET, NEW YORK.

CARY & MOEN,
MANUFACTURERS
STEEL WIRE for all purposes and STEEL SPRINGS of every description.

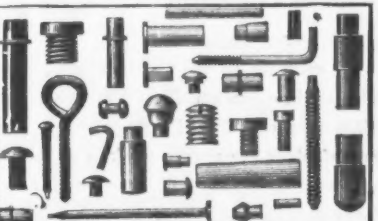


Market Steel Wire, Crinoline Wire, Tempered and Covered.
Also PATENT TEMPERED STEEL FURNITURE SPRINGS, constantly on hand.
234, 236 and 238 West 29th Street, NEW YORK.

THE FRED. J. MYERS MFG. CO.
COVINGTON, KY.,
MFRS. OF
WIRE GOODS OF ALL KINDS.




Wrought-Iron Fencing, Cresting and Hardware Specialties.
We carry a full stock of all widths Green, Drab, Figured and Landscape Wire Cloth.
SEND FOR ILLUSTRATED CATALOGUE AND PRICE LIST No. 18.



IRON AND BRASS RIVETS,
STUDS, PINS, SCREWS, &c.
For Manufacturers of Light Hardware.
BLAKE & JOHNSON, WATERBURY, CONN.

MILK TEMPERED
MORGAN SPRING CO.
WORCESTER, MASS.



W. S. TYLER
WIRE WORKS CO.
SUCCESSORS TO W. S. TYLER,
MANUFACTURERS OF
Wire Elevator Guards,
OFFICE RAILINGS, DESK RAILINGS,
SKYLIGHT GUARDS AND WIRE
WINDOW GUARDS
OF EVERY DESCRIPTION.
W. S. TYLER, Pres. E. H. ALLEN, Sec. & Treas.
CLEVELAND, OHIO.
THORN WIRE HEDGE CO.
STEEL BARB WIRE FENCING.



Some styles of Southern Plow Shippers made by
Gautier Steel Department,
JOHNSTOWN, PA.
Send for full illustrated list containing the
entire line of Southern and Western Shipments.
Chicago Office 202 First Nat. Bank Building.
New York Office, 104 Reade St. Phila. Office, 523 Arch St.

LUDLOW-SAYLOR WIRE CO.,
ST. LOUIS, MO.
WIRE, WIRE CLOTH, WIRE ROPE,
Counter Railings, Window Guards, Iron and Wire Fences,
Plain and Barbed Fencing Wire.



"S. & C." Sharp, Short, Rigid Barb.
Best Steel. Painted and Galvanized
"Kelly" Yielding Steel Points.
Best Wire Made. Does Not Lacerate Stock
"Red Star."
Covered with Celebrated Kelly Point.


ROOF CRESTING,
Tower Ornaments, Vanes, and Stable Fittings.
FULL LINE OF EACH MANUFACTURED BY
National Wire & Iron Co., DETROIT, MICH.
Send for Catalogue, stating your wants. Liberal Discounts to the Trade.



THOMPSON McCOSH, President. JOHN A. McCOSH, Sec. and Treas.
BARB WIRE
LIFTER AND CARRIER.
NO DANGER OF CUTTING HANDS OR TEARING CLOTHES.
SAVES THE PRICE OF THE LIFTER MANY TIMES EVERY DAY.
Manufactured Solely by
Hawkeye Steel Barb Fence Co., Burlington, Iowa.
Our Agents, John H. Graham & Co., 113 Chambers St., carry stock of our Lifters and will supply at factory prices.

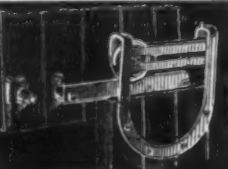
SEDGWICK
STEEL WIRE FENCE
Is the best general purpose wire fence in use. It is a strong network without barbs. Don't injure stock. It will turn dogs, pigs, sheep and poultry, as well as horses and cattle. The best fence for Farms, Gardens, Stock Ranges and Railroads. Very neat, pretty styles for Lawns, Parks, School-lots and Cemeteries. Covered with rust-proof paint, or made of galvanized wire, as preferred. It will last a life-time. It is better than boards or barbed wire in every respect. The Sedgwick Gates made of wrought-iron pipe and steel wire, defy all competition in lightness, neatness, strength and durability. We make the best, cheapest and easiest working all-iron automatic or self-opening gate, and the neatest cheap iron fences now made. The best Wire Stretchers, Cutting Pliers and Post Augers. For prices and particulars ask Hardware Dealers, or address, mentioning paper.
SEDGWICK BROS., Richmond, Ind.
EDWARD SUTTON, Eastern Agent,
300 Market St., Philadelphia, Pa.

NIEN-TSI CHINESE LACQUER,
Manufactured by ALBERT ASSMAN & SONS.
UNEQUALLED FOR DURABILITY. Prevents Iron, Steel, Brass, Nickel, Copper, Silver, Bronze and all compositions from corroding. Also resists dampness, KEROSENE OIL and FLY SPECKS. Can be applied without heating metal.
Sole Agents, H. S. ALLEN & CO., 112 John St., New York.
Would call special attention to manufacturers of Agricultural Implements, Machinery and Architectural Iron Works. Sample and Prices sent on application.



WIRE NAIL MACHINES
HARDMAN PATENT.
Thoroughly Tested and in Successful Operation.
For prices and particulars address the Manufacturers,
BIRMINGHAM IRON FOUNDRY,
FOUNDERS AND MACHINISTS,
BIRMINGHAM, CONN.

LANE'S PATENT STEEL DOOR HANGER.
The most perfect Anti-Friction Hanger in the Market, BECAUSE
It is made of steel throughout, except the wheel, which has a steel axle. It will not break. It is practically free from wear. It is almost noiseless in action. It requires no oil. It has a broad bearing on the door, and keeps in line. It is by far the most durable. It may be used with any track. It is always in order.
LANE'S PATENT TRACK
Is made of steel and is easily put in position. Catches and holds no snow or ice. Door hung thereon cannot jump the track. Is not subject to decay. Requires no fitting, but is ready at once. May be used with hangers of other manufacture.
Manufactured by **LANE BROS.,** Poughkeepsie, N. Y.
JOHN H. GRAHAM & CO., General Agents, 113 Chambers Street, NEW YORK.



The above cut represents Preston's Patent Braided Cable Wire Fence Rail, manufactured by the
HOLLOW CABLE MFG. CO., Hornellsville, N. Y. We also manufacture extensively four different sizes Wire Clothes Lines. Send for Circulars and Price Lists.
O. S. CHAMBERLAIN, 55 Dearborn St., Chicago, Ill.




E. T. BARNUM,
MANUFACTURER
WIRE AND IRON WORK
Detroit, Mich.
The Popular Polish of the world.
For sale by all dealers in U.S.A. and Canada. Price List Free.
THE PARLOR MFG. CO.,
85 Fulton St., Boston.



PHOSPHOR-BRONZE
For Bearings, Slide Valves, Cylinder Rings, Cross-Head Gibs, Steps, Bushings, and all purposes where Maximum Durability, Anti-Frictional and Non-Cutting Qualities are desirable. Pump Rods, Bolts and Nuts, Machine and Wood Screws, &c., &c. Combine Toughness, Strength, Durability and Resistance to Corrosion. Castings of all kinds to order. Send for pamphlet and prices.
"Phosphor-Bronze,"
THE PHOSPHOR-BRONZE SMELTING CO., LTD.,
No. 512 Arch Street, PHILADELPHIA, PA.
Owners of the U. S. Phosphor-Bronze Patents. Sole Manufacturers of Phosphor-Bronze in the U. S.
"SILVER FINISH"
Galvanized POULTRY NETTINGS.
FOR SALE BY THE HARDWARE TRADE. GET THE BEST.



THE BILLINGS & SPENCER CO. HARTFORD, CONN.
MANUFACTURERS OF
STANDARD MACHINE WRENCHES
SINGLE AND DOUBLE END
IN 16 SIZES.
DROP FORGED OF BAR STEEL
TAKING NUTS FOR 1/4 INCH UP TO AND INCLUDING NUTS FOR 1 1/4 INCH BOLTS
AND ALL DESCRIPTIONS OF STEEL AND IRON DROP FORGINGS.



WICKWIRE BROTHERS, CORTLAND, N. Y.,
MANUFACTURERS OF
WIRE CLOTH AND WIRE GOODS.
"CORTLAND" WINDOW SCREEN WIRE CLOTH.
Dish Covers, Corn Poppers, Coa Sieves, Flour Sieves, Etc., Etc.
Metallic Coal Sieves.



OGDEN & WALLACE,

85, 87, 89 & 91 Elm St., New York.

Iron AND Steel

Of every description kept in stock.

Agents for Park, Brother & Co.'s

BLACK DIAMOND STEEL.

All sizes of Cast and Machinery Steel constantly on hand.

PIERSON & CO.,

24 to 27 West Street, New York,

Acme Shafting.

ALL SIZES AND LENGTHS IN STOCK.

40% for Discount.

ABEEL BROTHERS,

ESTABLISHED 1765,

Iron * Merchants,

190 SOUTH ST., NEW YORK.

"CATASAUQUA" IRON.

Large Assortment of Extra Heavy Sizes on Hand.

"ARM CO." SHAFTING.

Also general assortment of Norway, Ulster and Refined Bar, Band, Hoop, Scroll, Angle Iron; Steel of all kinds, &c.

A. R. WHITNEY & CO.,

MANUFACTURERS OF AND DEALERS IN

Iron and Steel

AGENCIES:

PORTAGE IRON CO., Limited, Merchant Iron and Soft Steel and Cut Nails and Spikes.

NORWAY STEEL & IRON CO., Homogeneous Steel Plates.

BAY STATE IRON CO., Tank, Boiler and Girder Plates.

BRANDYWINE ROLLING MILL, Boiler Plates.

GLASGOW TUBE WORKS, Boiler Flues.

A. M. BYERS & CO., Wrought Iron Pipe.

CARNEGIE BROS. & CO., Limited, Iron and Steel Beams, Channels, Shapes and Shafting.

BROOKLYN WIRE NAIL CO., Steel Wire Nails.

THE CHESTER PIPE AND TUBE CO.

Plans and estimates furnished and contracts made for erecting Iron Structures of every description. Books containing cuts of all iron made sent on application by mail. Sample pieces at office.

Please address 17 Broadway, New York.

P. O. BOX 35.

Borden & Lovell,

70 & 71 WEST ST.,

L. N. LOVELL, C. A. GREENE, H. L. FREELAND, New York.

Agents for the sale of

FALL RIVER IRON WORKS CO.'S

Nails, Bands, Hoops and Rods.

DANVILLE NAIL & MFG. CO.'S

NAILS AND SPIKES.

BORDEN MINING CO.'S

CUMBERLAND COAL.

IMPORTED & AMERICAN

PIG IRON.

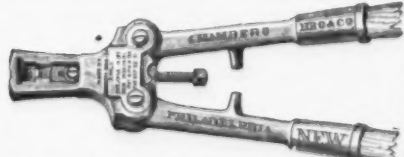
LAKE SUPERIOR CHARCOAL IRON,

For Malleable and Car-Wheel Purposes,

A SPECIALTY.

CHARLES HIMROD & CO.,

CHICAGO AND DETROIT.



BOLT & RIVET CLIPPERS,

For cutting off the ends of Bolts and Rivets, on carriages, wagons, harness, &c. Ask for them where you buy your hardware, or send for circular and price list.

CHAMBERS, BROTHER & CO.,

52nd St., Below Lancaster Ave.,

PHILADELPHIA, PA.

PASSAIC ROLLING MILL CO.

Manufacture and have always in stock

ROLLED IRON BEAMS,

Channels, Angles, Tees, Merchant Bars, Riveted Work, Forgings, Eye Bars, &c.,

PATERSON, N. J.

Room 45, Astor House, New York.

CUT NAILS,

Hot Pressed Nuts, Bolts, Washers, &c.

DOVER IRON CO.'S

Boiler Rivets, Boiler Brace Jaws, Socket Bolts, BAR IRON.

FULLER BROTHERS & CO.,

139 GREENWICH ST., NEW YORK.

Marshall Lefferts & Co.,

90 Beckman St., New York City.

MANUFACTURERS OF

Galvanized Sheet Iron,

Best Bloom, Best Refined and Common.

Galvanized Wire, Telegraph and Fence; Galvanized Hoop and Band Iron, Galvanized Rod and Bar Iron, Galvanized Nails, Galvanized Chain, Galvanized Iron Pipe.

CORRUGATED SHEET IRON

For Roofing, &c., Galvanized, Plain or Painted.

Best Charcoal, Best Refined and Common

SHEET IRON.

PLATE AND TANK IRON,

C. No. 1, C. H. No. 1, C. H. No. 1 Flange, Best Flange, Best Flange Fire Box, Circles.

ALL DESCRIPTIONS OF

IRON WORK GALVANIZED OR TINNED TO ORDER.

Price list and quotations sent upon application.

B. F. JUDSON,

Importer of and Dealer in

SCOTCH AND AMERICAN

Pig Iron,

WROUGHT & CAST SCRAP IRON,

OLD METALS.

457 & 459 Water St., NEW YORK.

233 & 235 South St., NEW YORK.

HICKS & DICKEY,

413 Commerce St., PHILA., PA.

Iron, Steel & Forgings

STEEL CASTINGS.

MERCHANT IRON & SOFT STEEL,

COLD ROLLED & TURNED SHAFTING.

AGENCIES:

CROWN & CUMBERLAND STEEL CO.,

CAST TOOL STEEL.

HARTMAN STEEL CO., Ltd.,

Tire, Toe, Sleigh, Machinery, Spring Steel, &c.

CHARLES L. BAILEY & CO., Chesapeake Nails.

HARTMAN STEEL CO., Ltd., Steel Wire Nails.

JOHN FOX,

Cast Iron Gas and Water Pipe.

2 to 48 Inches Diameter,

160 BROADWAY, NEW YORK.

JAMES WILLIAMSON & CO.,

SCOTCH AND AMERICAN

PIG IRON,

No. 63 Wall St., New York.

DANIEL F. COONEY,

88 Washington St., New York,

IRON AND STEEL BOILER PLATES.

GLASGOW IRON CO. PINE IRON WORKS.

ALLISON BOILER FLUES.

SOLID SHANK HOES

FOR SALE VERY LOW.

JOHN BROWER,

81 Murray Street.

CHAS. F. LOMBARD

Augusta, Ga.

MANUFACTURERS OF

GIN RIBS & RAILROAD CASTINGS.

OXFORD

IRON AND NAIL CO.,

Cut Nails

AND

SPIKES.

J. S. SCRANTON, Sales Agent,

81, 83 and 85 Washington Street,

NEW YORK.

BURDEN'S

HORSE SHOES.

"Burden Best"

Iron

Boiler Rivets.

THE BURDEN IRON CO.

TROY N. Y.

WILLIAM H. WALLACE & CO.,

Iron Merchants,

COR. ALBANY & WASHINGTON STS.,

NEW YORK CITY.

Wm. H. Wallace. Wm. Bispham. E. C. Wallace.

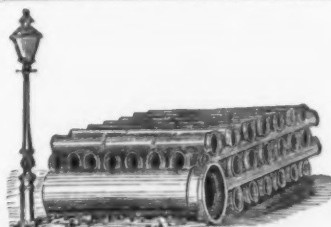
WM. MCFARLAND,

Iron and Brass Founder,

TRENTON, N. J.

Chilled Cast Wire Dies a Specialty.

Any size or style made at short notice.



R. D. WOOD & CO.,

PHILADELPHIA

Manufacturers of

Cast Iron Pipe

FOR WATER AND GAS,

LAMP POSTS, VALVES, ETC.

Mathew's Pat. Anti-Freezing Hydrants.

400 CHESTNUT STREET.

A. GARRISON, J. H. RICKETSON, WM. HOLMES.

A. GARRISON & CO.,

Manufacturers of Sand, Patent Homogeneous,

Steel and

Chilled Rolls,

BOTH SOLID AND HOLLOW.

Ore and Clay Pulverizers, Rotary Squeezers,

Haskin's Patent Double Spiral Pinions, and Rolling Mill Castings of every description.

Office, Nos. 10 & 12 WOOD ST., PITTSBURGH, PA.

CHAS. J. STEBBINS,

111 Reade St., New York,

STEEL AND IRON NAILS.

BUFFALO HAMMER COMPANY, Buffalo, N. Y.

Manufacturers of a full line of

SOLID CAST STEEL HAMMERS

Forged from the best Crucible Steel.

All Hammers Fully Warranted.

Drop Forgings a Specialty.

VARIETY METAL BOOM.

Iron Foundry and Machine Shop.

STEAM HEATING BY DIRECT RADIATION

in all its Branches a Specialty. Brass and other

Metal Moulding, Casting and Finishing. Noiseless

Vertical Engines, Hydrants, Fire Plugs, &c.

FRAS. B. SANNAN,

Pottsville, Schuylkill Co., Pa.

W. D. WOOD & CO., L'd,

PITTSBURGH, PA.



MANUFACTURERS OF PATENT

Planished Sheet Iron.

Patented April 8th, 1873; Sept. 6th, 1873; Oct. 6th, 1874; Jan. 11, 1876; Oct. 17th, 1876; Jan. 11th, 1877; Feb. 6th, 1877; Dec. 10th, 1878; Jan. 10th, 1880; Jan. 18th, 1884; Feb. 10th, 1884; March 4th, 1884; Jan. 6th, 1885.

Guaranteed fully equal in all respects to the

IMPORTED RUSSIA IRON,

and at a less price.

ALSO

Common, Refined Charcoal and Juniata

GRADES OF

BLACK SHEET IRON,

Smooth on both sides.

SYRACUSE

MALLEABLE IRON

WORKS,

SYRACUSE, - N. Y.

Mower and Reaper Castings and

Carriage Irons a Specialty.

W. B. BURNS, PROPRIETOR.

EVERSON, HAMMOND & ORR,

LIMITED,

PITTSBURGH, PA.

Sheet Steel

For Roofing and Corrugating.

OPEN-HEARTH STEEL, INGOTS and BILLETS.

SHEET IRON, All Grades.

CORRUGATED AND CRIMPED IRON ROOFING & SIDING.



IRON BUILDINGS, ROOFS, GABLES, DOORS, CORNICES, Skylights, Bridges, &c.

MOSELEY IRON BRIDGE AND ROOF CO.,

5 Day Street, NEW YORK.

GEORGE WESTINGHOUSE, JR., Pres. JOHN CALDWELL, Treas.

H. H. WESTINGHOUSE, Gen'l Agt. T. W. WELSH, Supt.

W. W. CARD, Secy.

Westinghouse Air-Brake Co.

PITTSBURGH, PA., U. S. A.

MANUFACTURERS OF THE

WESTINGHOUSE AUTOMATIC BRAKE, Westinghouse Locomotive Driver

Brake, Vacuum Brakes (Westinghouse & Smith Patents).

WESTINGHOUSE FREIGHT BRAKE.

The Automatic Freight Brake is essentially the same apparatus as the Automatic Brake for passenger cars, except that the various parts are so combined as to form practically one piece of mechanism, and is sold at a very low price. The saving in accidents, flat wheels, brakemen's wages, and the increased speed possible with perfect safety, will repay the cost of its application within a very short time.

The "Automatic" has proved itself to be the most efficient Train and Safety Brake known. Its application is instantaneous; it can be operated from any car in the train if desired, and should the train separate, or hose or pipe fail, it applies automatically. A GUARANTEE is given customers against loss from PATENT SUITS on the apparatus sold them.

The WESTINGHOUSE BRAKE is now fitted to upward of

15,000 ENGINES AND 80,000 CARS

and is adopted by the principal Railways in all parts of the world.

FULL INFORMATION FURNISHED ON APPLICATION.

LEECHBURG IRON WORKS.

KIRKPATRICK & CO., LIMITED

Manufacturers of all Grades of

FINE SHEET IRONS,

(Refined, Cold Rolled, Show Card, Stamping, Tea Tray, Polished, Shovel, Ferrule Iron, &c.)

NATURAL GAS USED AS FUEL.

OFFICE, No. 143 First Ave., Pittsburgh, Pa. WORKS, Leechburg, Pa.

CLOSES ON OUTSIDE OF NOSE. Only Double Ring Invented.

Champion Hog Ringer

RINGS and HOLDER.

The only Ring that will effectually keep Hogs from rooting. No sharp points in the nose.

CHAMBERS, BERING & QUINLAN CO., Exclusive Manufacturers, Decatur, Ill.

Only single Ring ever invented that closes on outside of the nose.

BROWN'S

Elliptical Ring

and Triple Groove Hog and Pig Ringer

Only single Ring that closes on the outside of the nose. No sharp points in the flesh to keep it sore.

J. M. SCHOONMAKER.

MANUFACTURER AND SHIPPER OF

CONNELLSVILLE

Capacity of Mines, 2500 Tons Daily.

Siding connections with all lines of Railroads.

Office, 120 Water Street PITTSBURGH PA.

COKE

WILLIAM R. HART & CO.,
SPANISH, AFRICAN, IRON ORES, AND ITALIAN

CASTLE PIG IRON.
For Finest Steel (phosphorus uniformly low, seldom reaching .02 per cent., and silicon from 1 per cent. upward, according to requirements of buyers).
Bessemer, Basic and Open-Hearth Steel Slabs, Billets, Plates and Bars to specifications furnished. Old Iron and Steel Rails, Crop Ends, Spiegeleisen, Ferromanganese, &c.

MOHICAN PIG IRON.
A superior iron for ordinary Bessemer work, comparing favorably with English West Coast Hematites.

226 Walnut Street, - - PHILADELPHIA.

Heavy Rails, Light Rails, Railway Fastenings, STREET RAILS,

Cambria Steel Rails.

ADDRESS
Cambria Iron Co.,
OFFICE, 218 South Fourth St., Philadelphia, Pa.
WORKS, Johnstown, Pennsylvania.

The Phoenix Iron Co.,
410 WALNUT ST., PHILADELPHIA,
Manufacturers of Wrought Iron

Beams, Deck Beams, Channels, Angle & Tee Bars,
STRAIGHT AND CURVED TO TEMPLATE.
Largely used in the construction of Iron Vessels, Buildings and Bridges.

Wrought Iron Roof Trusses, Girders and Joists, and all kinds of Iron Framing used in the construction of Fire Proof Buildings: **Patent Wrought Iron Columns, Weldless Eye Bars,** and Built-up Shapes for Iron Bridges.

REFINED BAR, SHAPING, and Every Variety of SHAPE IRON Made to order.
Plans and Specifications furnished. Address **DAVID REEVES, President.**
New York Agents, **MILLIKEN, SMITH & CO.,** 61 Liberty St.
Boston Agents, **HOUDLETTE & DUNNELS,** 272 Franklin St.

ALAN WOOD COMPANY,
MANUFACTURERS OF
Patent Planished, Galvanized, Common, Best Refined, Cleaned and Charcoal Bloom

PLATE & SHEET IRON,
ALSO LIGHT PLATES AND SHEETS OF STEEL,
No. 519 Arch Street, Philadelphia, Pa.

Orders solicited especially for Corrugated, Gasholder, Pan and Elbow, Water Pipe, Smoke Stack, Tank and Boat Iron; Last, Stamping, Ferrule Locomotive Headlight and Jacket Iron.

W. H. WALBAUM & CO.,
206 S. Fourth St., Philadelphia. 61 Pine St., New York.

NEW AND OLD RAILS, BLOOMS, BESSEMER PIG.
Crop Ends, Spiegeleisen, Iron Ores and Railroad Supplies Generally.
AGENTS IN THE UNITED STATES FOR

THE NORTH LONSDALE IRON & STEEL CO., Limited, Bessemer Pig Iron, brand "Diverston;" Malleable Pig Iron, brand "U. H. M." MOSS BAY HEMATITE IRON & STEEL CO., Limited, Spiegeleisen, Crop Ends, &c. Also for "Lorn" Malleable Charcoal Pig Iron and N. B. ALLEN & CO.'S Dinas Fire Bricks. Also Sole Agents for the WHITE RIVER MINING CO.'S Arkansas Manganese Ore, Guaranteed 50 per cent. Metallic Manganese.

PENCOYD IRON WORKS,
A. & P. ROBERTS & CO.,
MANUFACTURERS OF
BEAMS, CHANNELS, DECK BEAMS, ANGLES, TEES, PLATES, MERCHANT BAR.

STANDARD

SHAFTING AND ROLLED OR HAMMERED AXLES OF IRON OR STEEL
Office, No. 26 S. Fourth St., Philadelphia. Agents for the sale of Glamorgan Pig Iron.

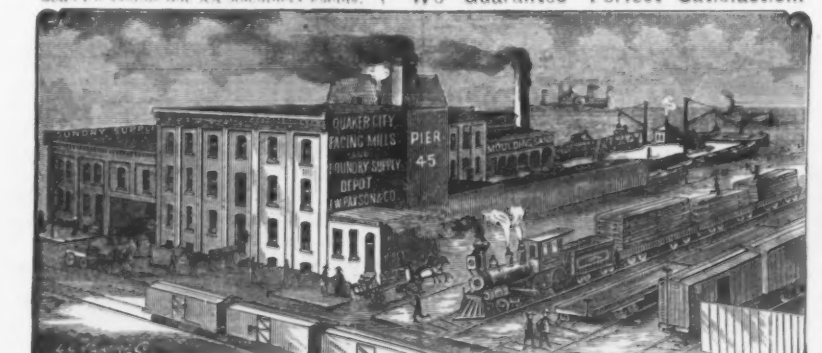
Agency Fire-Brick Hot-Blast Stove Co.

GORDON, STROBEL & LAUREAU,
ENGINEERS,
No. 226 Walnut Street, Philadelphia, Pa.
(Formerly of Witherow & Gordon, Pittsburgh, Pa.)

BLAST FURNACE CONSTRUCTION, STEEL WORKS CONSTRUCTION.

SPECIALTIES:
Gordon's Patent Improved Whitwell-Cowper Stoves, Gordon's Patent Converter for Treating Molten Iron, Improved Regenerative Furnaces, Coke Regenerative Ovens, Blast Furnace Improved Details, Tuyere Stocks and Tuyere Attachments, Boiler Setting giving the Greatest Efficiency, Cinder Car, Kennedy & Gordon's Patents.

QUAKER CITY FACING MILLS.
Send for sample bbl. (Star) Stove Plate Facing. Send for circular bbl. XX Machinery Pattern. We Guarantee Perfect Satisfaction.



RIDDLES, SHOVELS, BELLOWS, STEEL WIRE BRUSHES, BRISTLE BRUSHES, And all other Tools used in a Foundry, of our Own Special Make.
J. W. FAXSON & CO.,
DEALERS IN MOULDING SAND, AND MANUFACTURERS OF FOUNDRY SUPPLIES,
Nos. 1015, 1017, 1019 and 1021, or Pier 45 North, Del. Ave., - - - PHILADELPHIA, PA.

EDWARD J. ETTING
IRON BROKER & COMMISSION MERCHANT,
222 S. Third St., PHILADELPHIA, PA.
PIG, BAR and RAILROAD IRON, OLD RAILS, SCRAP, &c.
Agent for the
Mount Savage Fire Brick.
Eastern Penna., West New Jersey and Delaware.
LYNCHBURG IRON CO.,
LYNCHBURG, VA.
Foundry and Forge Pig Iron.
STORAGE, WHARF and YARD, Delaware Avenue, above Callowhill St., connected by track with railroad. CASH ADVANCES MADE ON IRON.

JAS. G. LINDSAY, THOS. S. PARVIN.
LINDSAY, PARVIN & CO.,
328 Walnut St., Phila.,
Iron and Steel Structural Material
FOR ALL PURPOSES.
Estimates furnished for Iron and Steel Structures and Railway construction. Correspondence solicited with railroad contractors.

L. & R. WISTER & CO.,
IRON COMMISSION MERCHANTS,
257 No. 4th St., Philadelphia.
AGENTS
Kemble and Norway Foundry and Forge Pig Iron. Wyebrooke C. B. Charcoal Pig Iron. Ferguson Red Short Pig Iron.
DEALERS IN ALL KINDS OF SCRAP IRON.

MORRIS, WHEELER & CO.,
Iron, Steel and Nails.
WAREHOUSE & OFFICES, 10th & Market Sts., PHILA., PA.
SALES OFFICES, 400 Chestnut St., PHILA., PA.
New York Address, 14 CLIFFE ST.

HENRY LEVIS & CO.,
Manufacturers' Agents
For Iron and Steel Rails, Car Wheels, Boiler and Sheet Iron and General Railway Equipments.
All Rails, Axles and Wheels bought and sold.
234 S. 4th St., Philadelphia.

Frank K. Esherick, Barclay W. Cotton.
ESHERICK & CO.,
263 So. 4th St., PHILADELPHIA
Iron and Steel of All Description.
Selling Agents for Cleveland City Forge and Iron Co., Forgings; Central Iron and Steel Works, Plates of Iron and Steel; Danville Nail and Mfg. Co., Iron and Steel Nails, Boiler Tubes; Bridge, Car and Boat Specifications a Specialty.

J. J. MOHR,
430 WALNUT ST., PHILA., PA.,
SOLE AGENT FOR
Sheridan, Leesport, Temple, Lynchburg, Millcreek and Mt. Laurel
Foundry **PIG IRON** and Forge
CHARCOAL PIG IRON.
Also Woodbridge Clay Mining Co.'s Fire Brick.

THE ALLENTOWN ROLLING MILLS,
MANUFACTURERS OF
Rails, Bars, Axles, Shafting, Fish Bars (Plain and Angle), Spikes, Rivets, Bolts and Nuts, &c. Bridges and Turn-Tables.
General Office, 237 South Third St., Philadelphia. Works at Allentown, Pa.

PLYMOUTH ROLLING MILL CO., Conshohocken, PA.
MANUFACTURERS OF
Pig Iron,
Foundry and Forge.
Puddled Bars,
Special for Axles, Best Neutral and Common.
Particular attention given to Iron for Special Purposes.

Plate and Sheet Steel,
Every description of Light Plates and Sheets of Steel.
Plate and Sheet Iron,
Best Bloom, Tube, Cleaned, Best Refined, Skelp, Blue Annealed and Common.
Special Wheels for Furnace and Mine Cars.

TESTED CHAINS.
Bradlee & Co., Empire Chain Works,
816 Richmond St., Philadelphia.

Chains for Foundry Cranes and Slings.
"D. B. G." Special Crane Chain.
Steel and Iron Dredging, Slope and Mining Chains.
Ship's Cables and Marine Railway Chains.

CUMBERLAND NAIL AND IRON CO.,
MANUFACTURERS OF
"CUMBERLAND" NAILS & WROUGHT IRON PIPE,
43 North Water St., and 44 North Delaware Ave., PHILADELPHIA.

J. Tatnall Lea & Co.,
Successors to CABERN & CO.,
IRON COMMISSION MERCHANTS
No. 400 Chestnut Street, Philadelphia.
BESSEMER, MILL and FOUNDRY PIG IRON, SKELP IRON, MUCK and SCRAP BARS, N. course, in asphalt, but in relation of it. It is especially if one other method constantly vary, both changes of weather, caused cannot be followed. Hence it must follow that there must be found inter-A face between the blocks and The arguments advanced in Baltimore. Price lists on application.

BOOTH, GARRETT & BLAIR
ANALYTICAL AND CONSULTING CHEMISTS
919 and 921 Chant St. (10th St., above Chestnut St.), Phil material employed for
Established in 1836.
Analysis of Ores, Waters, Metals and Alloys of all kinds. A specimen which damp may percolate through all the apparatus and appliances for the rapid and elasticizing—to coin a word—this relation. Intimately associated with

JUSTICE COX, JR., CHARLES K. BARNES.
JUSTICE COX, JR., & CO.,
AGENTS FOR
CATASAUQUA M'FG. CO.,
Iron, Steel,
Bars, Boiler, Tank and Bridge Plates; Skelp, Angles and Shapes; Chick's, Montgomery, Conways and Allen Furnaces.
PIG IRON
for Foundries and Mills.
ERIE FORGE CO., L. To. Iron and Steel Forgings; Every shape.
224 South Fourth Street, - Phila., Pa.

Jerome Keeley & Co.,
206 Walnut Place, Phila.,
Selling Agents for CHARCOAL and ANTHRACITE BLOOMS, PIG IRON, BAR IRON, SHEET IRON, STEEL and IRON RAILS, IRON CLAD STEEL RAILS and BARS, MAGNETIC and HEMATITE IRON ORES, FIRE BRICK, COAL and COKE, MUCK BARS. Handle Old Iron and Steel Rails, Scrap Iron, &c. Examine and negotiate sales of Iron and Coal properties.
E. H. Wilson. A. Kaiser. J. B. M. Hiron.
E. H. WILSON & CO.,
222 and 224 South Third St., Philadelphia.
BROKERS AND DEALERS IN
IRON AND STEEL.
Correspondence solicited.

J. W. HOFFMAN & CO.,
IRON COMMISSION MERCHANTS,
208 South Fourth St., Philadelphia.
Selling Agents PINE IRON WORKS, Pine Brand Plates; GLASGOW IRON CO., Plates and Muck Bars; PIANG STEEL & IRON CO. (Limited), Siemens-Martin (Open Hearth) Steel, Universal and Sheared Plates, Angles and Shapes.

JNO. L. HOGAN,
IRON COMMISSION MERCHANT,
216 SOUTH FOURTH ST., PHILA.
Pig Iron & Ores, Steel & Iron Blooms.
Agent for Briar Hill Iron and Coal Co., Youngstown Steel Co., Open Hearth Metal, Charcoal Iron, Connellsville Coke, Old Rails, Scrap, &c.

Andover Pig Iron.
FOR BEST MILL PRODUCTS
Andover Chill Iron for Carwheels, &c.
Each Pig marked exact chill depth (3/4 in. to 1 1/2 in.), A. Whitney & Son's standard test.
F. A. COMLY, Treas.
J. WESLEY PULLMAN, Agent. 240 So. 3d St., Phila.
PEDRO G. SALOM, J. P. L. WESTESSON.

SALOM & WESTESSON,
Philadelphia Testing Laboratory,
208 SOUTH FOURTH STREET, PHILADELPHIA.
Analytical and Consulting Chemists, Assayers and Metallurgists, Physical Testing.
Established 1847.

A. WHITNEY & SONS,
CAR WHEEL WORKS,
PHILADELPHIA.
Special Wheels for Furnace and Mine Cars.

The Effect of Frost on Different Roadways.

There is scarcely any condition of weather which has a more injurious effect upon our thoroughfares than frost, especially should it chance to be, as it was during last winter, of exceptionally long continuance. Every road-maker, says the *Engineer* in a recent article on the subject, is aware of the risks he runs, under such circumstances, of finding that all his efforts toward perfecting the condition of his roads have been negated by such an untoward event, and it seems desirable, at a time when so many arguments are being advanced by the advocates of the several systems which are in use among us, to consider which of them is the least liable to be affected by this dreaded enemy. It is as well to use the words "least liable," because all experience goes to show that there is not one of those systems but what is, under certain conditions, open to injurious action upon it by frost. No one could walk the streets of London, for instance, during the late severe weather without noticing that in some way or another one and all of the street pavings of which this city possesses so many diverse examples had suffered in some degree from its effects. It will be as well to take the cases categorically, and to make reference first to those macadamized roadways which were the first effort of our progenitors toward improving our means of communication.

Intimately connected with this subject is, of course, that of perfect surface drainage. Frost can have but little effect upon any roadway which, retaining its perfect form, and sound as regards its covering, at once throws off all moisture falling upon it. The basis of its operation is thus lost to the frost, and it must prove altogether innocuous. But this is supposing a condition of things which is impossible of realization. No macadamized roadway can, under the exigencies of traffic, be maintained invariably in the state which alone could insure immunity from the injury under consideration. Inequalities must exist in all such road surfaces, affording a lodgment for water in a greater or less degree, and it matters but little what that degree may be. For it is evident from the teaching of all experience that the shallower the water film the more quickly is it acted upon and solidified, while the effect in causing injury to the road surface is fully equal to that which may be due to a greater mass of frozen water. In fact, in the case of macadamized roads it may almost be said that the thicker the ice that is formed the less chance there is of the metal being disturbed by traffic while disintegrated, so to speak, from the effect of frost. It is therefore often found that roads of this class which are comparatively in a good state of repair suffer equally, if not even in a greater relative degree, than those which have developed more the results of wear and tear. It is on a form of road construction composed of a mass of units liable to disintegration that frost exercises its most potent effects.

The swelling of the innumerable joints inseparable from Macadam's system quickly forces out of position the metal, however thoroughly it may have been consolidated by steam rolling or by a constant stream of traffic. The binding material itself assumes a condition in which it readily pulverizes to mere dust, and as the result we see the roadway under frost covered with loose metal, and each passing vehicle cutting deeper and deeper into the disturbed mass. Such an effect, it would seem, can never be guarded against on macadamized roads. Their construction is of a character which lends itself greatly to aid in the destructive effect of frost. Nor is it alone the center of the roadway—that is, the portion which bears the traffic—that suffers. Injury is particularly liable to occur from the cause named at the edges of the road unless the side drains where they line the metaling make an almost water-tight joint with it. Indeed, it is in such position that frost often exercises its most injurious action. At such points the metaling is, as a rule, greatly reduced in thickness, and, although it is less exposed to the disrupting effect of traffic, it is more easily permeated by damp from imperfectly cleared side drains, and the thin coat of metal, when that dampness becomes solidified by frost, breaks up almost at once, the debris being thrown into the side drains, causing a further blocking of them and intensifying the means of injury. So serious are the results in such instances that a gentleman well-practiced in road construction held that it would pick, 44 economical to combine the system of asphalt paving with that of Macadam. He prorgings for lay a width of at least a foot alongsides for sides of his roads with metal; forgings for asphalt or other water proof pound; forgings there arose the difficulty thand; forgings for in a combination of syst pound; forgings for case being the impossibls per pound; forged asphalted line with thigs, 64 cents per pound, work. Weakness a'gas-check rings, 64 cents would have been s' degree of expansion put in the following varying sorts: Rolled hoops, 36 cents plan—effectivly trannion hoops, \$1 per pound. per se—had for furnishing cannon, carriages, precautions as follows: Hotchkiss & Co., six regard akiss revolving cannon, 37 mm. caliber to gu'5 in.), \$7800; carriages, \$3000; limbers, gen'2250; accessions in reserve parts for guns and carriages, \$1050; ammunition wagons, \$4500; accessions for wagons, \$600; loading tools, \$100; percussion shells, fuse, cartridge case, and wad, \$1 each; canister shot, 62 cents each.

The following are the bids on cored shot: West Point Foundry Association—shot, \$20 each; copper bands, \$2.25 each. South Boston Iron Works, Boston, Mass.—\$30.30 and \$2. Talbot & Sons, Richmond, Va.—\$30 and \$2. Tredegar Co., Richmond—\$60 and \$3.

The bids for supplying the army with a cast-iron body for a 12-inch mortar were: South Boston Iron Works, Boston, Mass., \$3500; Builders' Iron Foundry, Providence, R. I., \$5000.

A curious instance of the ambition of new traders is offered by the following item from an English newspaper: Daniell, Marks & Co., Limited, is the title of a company

OGDEN & WALLACE,
85, 87, 89 & 91 Elm St., New York.
Iron and Steel
Of every description kept in stock.
Agents for Park, Brother & Co.'s
BLACK DIAMOND STEEL.
All sizes of Cast and Machinery Steel constantly on hand.

PIERSON & CO.,
24 to 27 West Street, New York,
Acme Shafting.
ALL SIZES AND LENGTHS IN STOCK.
40% for Discount.

ABEEL BROTHERS,
ESTABLISHED 1765,
Iron & Merchants,
190 SOUTH ST., NEW YORK.
365 WATER ST., NEW YORK.
"CATASAUQUA" IRON.
Large Assortment of Extra Heavy Sizes on Hand.
"ARM CO." SHAFTING.

Also general assortment of Norway, Ulster and
Refined Bar, Band, Hoop, Scroll, Angle Iron;
Steel of all kinds, &c.

A. R. WHITNEY & CO.,
MANUFACTURERS OF AND DEALERS IN
Iron and Steel

AGENCIES:
PORTAGE IRON CO., Limited, Merchant Iron and
Soft Steel and Cut Nails and Spikes.
NORWAY STEEL & IRON CO., Homogeneous
Steel Plates.
BAY STATE IRON CO., Tank, Boiler and Girder
Plates.
BRANDYWINE ROLLING MILL, Boiler Plates.
GLASGOW TUBE WORKS, Boiler Flues.
A. M. BYERS & CO., Wrought Iron Pipe.
CARNEGIE BROS. & CO., Limited, Iron and
Steel Beams, Channels, Shapes and Shafting.
BROOKLYN WIRE NAIL CO., Steel Wire Nails
THE CHESTER PIPE AND TUBE CO.
Plans and estimates furnished and contracts
made for erecting Iron Structures of every descrip-
tion. Books containing cuts of all iron made sent
on application by mail. Sample pieces at office.
Please address 17 Broadway, New York.
P. O. BOX 35.

Borden & Lovell,
70 & 71 WEST ST.,
L. N. LOVELL,
C. A. GREENE,
H. L. FREELAND,
New York.

Agents for the sale of
FALL RIVER IRON WORKS CO.'S
Nails, Bands, Hoops and Rods.

DANVILLE NAIL & MFG. CO.'S
NAILS AND SPIKES.

BORDEN MINING CO.'S
CUMBERLAND COAL.

IMPORTED & AMERICAN
PIG IRON.

LAKE SUPERIOR CHARCOAL IRON,
For Malleable and Car-Wheel Purposes,
A SPECIALTY.

CHARLES HIMROD & CO.,
CHICAGO AND DETROIT.

BOLT & RIVET CLIPPERS,
For cutting off the ends of Bolts and Rivets, on
carriages, wagons, harness, &c. Ask for them
where you buy your hardware, or send for cir-
cular and price list.

CHAMBERS, BROTHER & CO.,
22nd St., Below Lancaster Ave.,
PHILADELPHIA, PA.

PASSAIC ROLLING MILL CO.
Manufacture and have always in stock
ROLLED IRON BEAMS,
Channels, Angles, Tees, Merchant Bars, Riveted Work,
Forgings, Eye Bars, &c.,
PATERSON, N. J.
Room 45, Astor House, New York.

CUT NAILS,
Hot Pressed Nuts, Bolts, Washers, &c.

DOVER IRON CO.'S
Boiler Rivets, Boiler Brace Jaws, Socket Bolts,
BAR IRON.

FULLER BROTHERS & CO.,
139 GREENWICH ST., NEW YORK.

Marshall Lefferts & Co.,
90 Beekman St., New York City.
MANUFACTURERS OF
Galvanized Sheet Iron,
Best Bloom, Best Refined and Common.

Galvanized Wire, Telegraph and Fence; Galvanized
Hoop and Band Iron, Galvanized Rod and Bar Iron,
Galvanized Nails, Galvanized Chain, Galvanized Iron
Pipe.

CORRUGATED SHEET IRON
For Roofing, &c., Galvanized, Plain or Painted.
Best Charcoal, Best Refined and Common
SHEET IRON.

PLATE AND TANK IRON,
C. No. 1, C. H. No. 1, C. H. No. 1 Flange, Best Flange,
Best Flange Fire Box, Circles.

ALL DESCRIPTIONS OF
IRON WORK GALVANIZED OR TINNED TO ORDER.
Price list and quotations sent upon application.

B. F. JUDSON,
Importer of and Dealer in
SCOTCH AND AMERICAN
Pig Iron,
WROUGHT & CAST SCRAP IRON,
OLD METALS.

457 & 459 Water St., NEW YORK.
233 & 235 South St., NEW YORK.

HICKS & DICKEY,
413 Commerce St., PHILA., PA.

Iron, Steel & Forgings
STEEL CASTINGS.

MERCHANT IRON & SOFT STEEL,
COLD ROLLED & TURNED SHAFTING.

AGENCIES:
CROWN & CUMBERLAND STEEL CO.,
CAST TOOL STEEL.

HARTMAN STEEL CO., Ltd.,
Tire, Toe, Sleigh, Machinery, Spring Steel, &c.

CHARLES L. BAILEY & CO., Chesapeake Nails.

HARTMAN STEEL CO., Ltd., Steel Wire Nails.

JOHN FOX,
Cast Iron Gas and Water Pipe.
2 to 48 Inches Diameter,
160 BROADWAY, NEW YORK.

JAMES WILLIAMSON & CO.,
SCOTCH AND AMERICAN
PIG IRON,
No. 63 Wall St., New York.

DANIEL F. COONEY,
88 Washington St., New York,
IRON AND STEEL BOILER PLATES.

GLASGOW IRON CO. PINE IRON WORKS.
ALLISON BOILER FLUES.

SOLID SHANK HOES
FOR SALE VERY LOW.

JOHN BROWER,
81 Murray Street.

CHAS. F. LOMBARD
Augusta, Ga.
MANUFACTURERS OF
GIN RIBS & RAILROAD CASTINGS.

Chilled Rolls,
BOTH SOLID AND HOLLOW.

Ore and Clay Pulverizers, Rotary Squeezers,
Haskin's Patent Double Spiral Pinions, and Roll-
ing Mill Castings of every description.
Office, Nos. 10 & 12 WOOD ST., PITTSBURGH, PA.

CHAS. J. STEBBINS,
111 Reade St., New York,
STEEL AND IRON NAILS.

BUFFALO HAMMER COMPANY, Buffalo, N. Y.
Manufacturers of a full line of
SOLID CAST STEEL HAMMERS
Forged from the best Crucible Steel.

All Hammers Fully Warranted.
Drop Forgings a Specialty.

VARIETY METAL BOOM.
Iron Foundry and Machine Shop.
STEAM HEATING BY DIRECT RADIATION
in all its Branches a Specialty. Brass and other
Metal Moulding, Casting and Finishing. Noiseless
Vertical Engines, Hydrants, Fire Plugs, &c.

FRAS. B. BANNAN,
Pottsville, Schuylkill Co., Pa.

OXFORD
IRON AND NAIL CO.,
Cut Nails
AND
SPIKES.

J. S. SCRANTON, Sales Agent,
81, 83 and 85 Washington Street,
NEW YORK.

BURDEN'S
HORSE SHOES.

"Burden Best"
Iron
Boiler Rivets.

THE BURDEN IRON CO.
TROY N. Y.

WILLIAM H. WALLACE & CO.,
Iron Merchants,
COR. ALBANY & WASHINGTON STS.,
NEW YORK CITY.

Wm. H. Wallace. Wm. Bispham. E. C. Wallace.

WM. MCFARLAND,
Iron and Brass Founder,
TRENTON, N. J.

Chilled Cast Wire Dies a Specialty.
Any size or style made at short notice.

R. D. WOOD & CO.,
PHILADELPHIA
Manufacturers of
Cast Iron Pipe
FOR WATER AND GAS,
LAMP POSTS, VALVES, ETC.

Mathew's Pat. Anti-Freezing Hydrants.
400 CHESTNUT STREET.

A. GARRISON, J. H. RICKETSON, WM. HOLMES.
A. GARRISON & CO.,
Manufacturers of Sand, Patent Homogeneous,
Steel and

Chilled Rolls,
BOTH SOLID AND HOLLOW.

Ore and Clay Pulverizers, Rotary Squeezers,
Haskin's Patent Double Spiral Pinions, and Roll-
ing Mill Castings of every description.
Office, Nos. 10 & 12 WOOD ST., PITTSBURGH, PA.

CHAS. J. STEBBINS,
111 Reade St., New York,
STEEL AND IRON NAILS.

BUFFALO HAMMER COMPANY, Buffalo, N. Y.
Manufacturers of a full line of
SOLID CAST STEEL HAMMERS
Forged from the best Crucible Steel.

All Hammers Fully Warranted.
Drop Forgings a Specialty.

VARIETY METAL BOOM.
Iron Foundry and Machine Shop.
STEAM HEATING BY DIRECT RADIATION
in all its Branches a Specialty. Brass and other
Metal Moulding, Casting and Finishing. Noiseless
Vertical Engines, Hydrants, Fire Plugs, &c.

FRAS. B. BANNAN,
Pottsville, Schuylkill Co., Pa.

W. D. WOOD & CO., L'd,
PITTSBURGH, PA.



MANUFACTURERS OF PATENT
Planished Sheet Iron.

Patented April 8th, 1873; Sept. 6th, 1873; Oct.
6th, 1874; Jan. 11, 1876; Oct. 17th, 1876; Jan.
11th, 1877; Feb. 6th, 1877; Dec. 10th, 1878;
Jan. 10th, 1882; Jan. 1st, 1884; Feb. 12th, 1884;
March 4th, 1884; Jan. 6th, 1885.

Guaranteed fully equal in all respects to the

IMPORTED RUSSIA IRON,
and at a less price.

ALSO
Common, Refined Charcoal and Junata
GRADES OF
BLACK SHEET IRON,
Smooth on both sides.

SYRACUSE
MALLEABLE IRON
WORKS,
SYRACUSE, - N. Y.

Mower and Reaper Castings and
Carriage Irons a Specialty.

W. B. BURNS, PROPRIETOR.

EVERSON, HAMMOND & ORR,
LIMITED,
PITTSBURGH, PA.,
Sheet Steel
For Roofing and Corrugating.

OPEN-HEARTH STEEL, INGOTS and BILLETS.
SHEET IRON, All Grades.

CORRUGATED AND CRIMPED IRON ROOFING & SIDING.

Iron Buildings, Roofs, gutters, Doors, Cornices,
Skylights, Bridges, &c.
MOSELEY IRON BRIDGE AND ROOF CO.,
5 Day Street. NEW YORK.

GEORGE WESTINGHOUSE, Jr., Pres. **JOHN CALDWELL, Treas.** **T. W. WELSH, Supt.**
H. H. WESTINGHOUSE, Gen'l Agt. **W. W. CARD, Secy.**

Westinghouse Air-Brake Co.
PITTSBURGH, PA., U. S. A.

MANUFACTURERS OF THE
WESTINGHOUSE AUTOMATIC BRAKE, Westinghouse Locomotive Driver
Brake, Vacuum Brakes (Westinghouse & Smith Patents).

WESTINGHOUSE FREIGHT BRAKE.
The Automatic Freight Brake is essentially the same apparatus as the Automatic Brake for
passenger cars, except that the various parts are so combined as to form practically one piece of
mechanism, and is sold at a very low price. The saving in accidents, flat wheels, brakemen's wages,
and the increased speed possible with perfect safety, will repay the cost of its application within
a very short time.

The "Automatic" has proved itself to be the most efficient Train and Safety Brake known. Its
application is instantaneous; it can be operated from any car in the train if desired, and should the
train separate, or hose or pipe fail, it applies automatically. A GUARANTEE is given customers
against loss from PATENT SUITS on the apparatus sold them.

The WESTINGHOUSE BRAKE is now fitted to upward of
15,000 ENGINES AND 80,000 CARS
and is adopted by the principal Railways in all parts of the world.

FULL INFORMATION FURNISHED ON APPLICATION.

LEECHBURG IRON WORKS.
KIRKPATRICK & CO., LIMITED
Manufacturers of all Grades of
FINE SHEET IRONS,
(Refined, Cold Rolled, Show Card, Stamping, Tea Tray, Polished, Shovel, Ferrule Iron, &c.)
NATURAL GAS USED AS FUEL.

OFFICE, No. 143 First Ave., Pittsburgh, Pa.

WORKS, Leechburg, Pa.

CLOSES ON OUTSIDE OF NOSE.
Only Double Ring Invented.
Champion Hog Ringer
RINGS and HOLDER.
The only Ring that will effectually
keep hogs from rooting. No
sharp points in the nose.

CHAMBERS, BERING & QUINLAN CO., Exclusive Manufacturers, Decatur, Ill.

J. M. SCHOONMAKER,
MANUFACTURER AND SHIPPER OF
CONNELLSVILLE COKE

Capacity of Mines, 2500 Tons Daily.
Siding connections with all lines of Railroads.

Office, 120 Water Street PITTSBURGH PA.

JAMES P. WITHEROW
Engineer & Contractor,
Lewis Block, PITTSBURGH, Pa.,
GENERAL AGENT FOR
WHITWELL FIRE-BRICK STOVES
AND
CLAPP-GRIFFITHS PATENTS FOR MANUFACTURE
OF SOFT STEEL,
specially adapted for A No. 1 Boiler Plates,
Boiler Rivets, Wire Rods, Stay Bolts,
Stamping Ware, Nail Plates, &c.

Will contract to completely erect, equip
and place in operation Blast Furnace Whit-
well Stoves and Steel Plants as above. As
I manufacture at our own works everything
appertaining to Blast Furnace and Steel
Works construction, can guarantee prompt-
ness and satisfaction.

Manhattan Rolling Mill.
J. LEONARD,
445 to 451 West St., NEW YORK,
177 & 179 Bank St.,
MANUFACTURER OF
HORSE SHOE IRON,
Toe Calk Steel, Rods, Ovals, Half Ovals and Flats.

Bonnell, Botsford & Co.,
IRON, NAILS AND SPIKES
YOUNGSTOWN, OHIO.

Howard, Childs & Co.,
Commission Merchants,
Room 20, Lewis Block, Pittsburgh, Pa.

Iron and Steel of all Descriptions,
Iron and Steel Nails, Heavy Hardware,
Coa Hods, Dripping Pans, &c.

Pittsburgh Manufactured Goods of all Kinds.
Correspondence solicited. Prices on application.

E. JENCKES MANFG. CO.,
PAWTUCKET, R. I.,
Bright Wire Goods, Belt Hooks,
SPRING PINS, KEYS AND COTTERS.
Best Wire Goods of all kinds a Specialty.

New York Office, 88 Chambers Street.
SAMUEL A. HAINES, Selling Agent

THE
Westinghouse Air-Brake Co.
PITTSBURGH, PA., U. S. A.

MANUFACTURERS OF THE
WESTINGHOUSE AUTOMATIC BRAKE, Westinghouse Locomotive Driver
Brake, Vacuum Brakes (Westinghouse & Smith Patents).

WESTINGHOUSE FREIGHT BRAKE.
The Automatic Freight Brake is essentially the same apparatus as the Automatic Brake for
passenger cars, except that the various parts are so combined as to form practically one piece of
mechanism, and is sold at a very low price. The saving in accidents, flat wheels, brakemen's wages,
and the increased speed possible with perfect safety, will repay the cost of its application within
a very short time.

The "Automatic" has proved itself to be the most efficient Train and Safety Brake known. Its
application is instantaneous; it can be operated from any car in the train if desired, and should the
train separate, or hose or pipe fail, it applies automatically. A GUARANTEE is given customers
against loss from PATENT SUITS on the apparatus sold them.

The WESTINGHOUSE BRAKE is now fitted to upward of
15,000 ENGINES AND 80,000 CARS
and is adopted by the principal Railways in all parts of the world.

FULL INFORMATION FURNISHED ON APPLICATION.

LEECHBURG IRON WORKS.
KIRKPATRICK & CO., LIMITED
Manufacturers of all Grades of
FINE SHEET IRONS,
(Refined, Cold Rolled, Show Card, Stamping, Tea Tray, Polished, Shovel, Ferrule Iron, &c.)
NATURAL GAS USED AS FUEL.

OFFICE, No. 143 First Ave., Pittsburgh, Pa.

WORKS, Leechburg, Pa.

CLOSES ON OUTSIDE OF NOSE.
Only Double Ring Invented.
Champion Hog Ringer
RINGS and HOLDER.
The only Ring that will effectually
keep hogs from rooting. No
sharp points in the nose.

CHAMBERS, BERING & QUINLAN CO., Exclusive Manufacturers, Decatur, Ill.

J. M. SCHOONMAKER,
MANUFACTURER AND SHIPPER OF
CONNELLSVILLE COKE

Capacity of Mines, 2500 Tons Daily.
Siding connections with all lines of Railroads.

Office, 120 Water Street PITTSBURGH PA.

**Only single Ring ever invented
that closes on outside of the nose.**
BROWN'S
Elliptical Ring
and Triple Groove Hog and Pig Ringer
Only single Ring that closes on
the outside of the nose. No sharp
points in the nose to keep it sore.

CHAMBERS, BERING & QUINLAN CO., Exclusive Manufacturers, Decatur, Ill.

J. M. SCHOONMAKER,
MANUFACTURER AND SHIPPER OF
CONNELLSVILLE COKE

Capacity of Mines, 2500 Tons Daily.
Siding connections with all lines of Railroads.

Office, 120 Water Street PITTSBURGH PA.

WILLIAM R. HART & CO.,
SPANISH, AFRICAN **IRON ORES** AND ITALIAN

CASTLE PIG IRON. For Finest Steel (phosphorus uniformly low, seldom reaching 0.1 per cent., and Silicon from 1 per cent. upward, according to requirements of buyers).
Bessemer, Basic and Open-Hearth Steel Slabs, Billets, Plates and Bars to specifications furnished. Old Iron and Steel Rails, Crop Ends, Spiegeleisen, Ferromanganese, &c.

MOHICAN PIG IRON. A superior iron for ordinary Bessemer work, comparing favorably with English West Coast Hematites.

226 Walnut Street, - - - PHILADELPHIA.

Heavy Rails, Light Rails, Railway Fastenings, STREET RAILS,

Cambria Steel Rails.

ADDRESS
Cambria Iron Co.,
218 South Fourth St., Philadelphia, Pa.

WORKS,
Johnstown, Pennsylvania.

The Phoenix Iron Co.,
410 WALNUT ST., PHILADELPHIA,
Manufacturers of Wrought Iron

Beams, Deck Beams, Channels, Angle & Tee Bars.
STRAIGHT AND CURVED TO TEMPLATE,
Largely used in the construction of Iron Vessels, Buildings and Bridges.

Wrought Iron Roof Trusses, Girders and Joists, and all kinds of Iron Framing used in the construction of Fire-Proof Buildings: **Patent Wrought Iron Columns, Weldless Eye Bars,** and Built-up Shapes for Iron Bridges.

REFINED BAR, SHAPING, and Every Variety of SHAPE IRON Made to order.
Plans and Specifications furnished. Address **DAVID REEVES, President.**
New York Agents, MILLIKEN, SMITH & CO., 61 Liberty St.
Boston Agents, HOUDLETTE & DUNNELS, 272 Franklin St.

ALAN WOOD COMPANY,
MANUFACTURERS OF
Patent Planished, Galvanized, Common, Best Refined, Cleaned and Charcoal Bloom
PLATE & SHEET IRON,
ALSO LIGHT PLATES AND SHEETS OF STEEL,
No. 519 Arch Street, Philadelphia, Pa.

Orders solicited especially for Corrugated, Gasholder, Pan and Elbow, Water Pipe, Smoke Stack, Tank and Boat Iron; Last, Stamping, Ferrule Locomotive Headlight and Jacket Iron.

W. H. WALBAUM & CO.,
206 S. Fourth St., Philadelphia. 61 Pine St., New York.

NEW AND OLD RAILS, BLOOMS, BESSEMER PIG.
Crop Ends, Spiegeleisen, Iron Ores and Railroad Supplies Generally.
AGENTS IN THE UNITED STATES FOR

THE NORTH LONSDALE IRON & STEEL CO., Limited, Bessemer Pig Iron, brand "Ulverson," Malleable Pig Iron, brand "U. H. M."
MOSS BAY HEMATITE IRON & STEEL CO., Limited, Spiegeleisen, Crop Ends, &c.
Also for "Lora" Malleable Charcoal Pig Iron and N. B. ALLEN & CO.'S Dinas Fire Bricks.
Also Sole Agents for the **WHITE RIVER MINING CO.'S** Arkansas Manganese Ore, Guaranteed 50 per cent. Metallic Manganese.

PENCOYD IRON WORKS,
A. & P. ROBERTS & CO.,
MANUFACTURERS OF
BEAMS, CHANNELS, DECK BEAMS, ANGLES, TEES, PLATES, MERCHANT BAR.

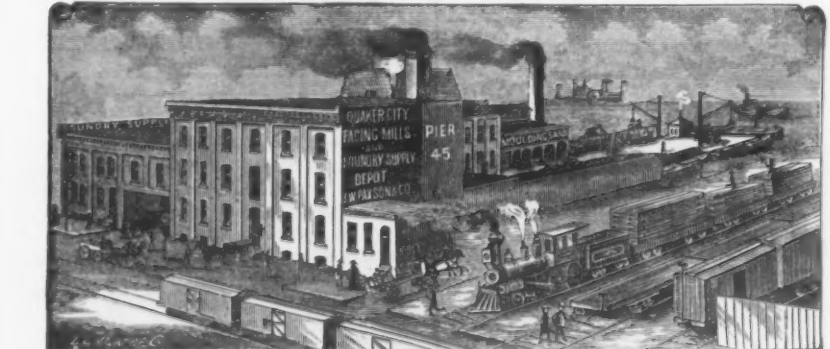
SHAFTING AND ROLLED OR HAMMERED AXLES OF IRON OR STEEL.
Office, No. 26 S. Fourth St., Philadelphia. Agents for the sale of Glamorgan Pig Iron.

Agency Fire-Brick Hot-Blast Stove Co.
GORDON, STROBEL & LAUREAU,
ENGINEERS,
No. 226 Walnut Street, Philadelphia, Pa.
(Formerly of Witherow & Gordon, Pittsburgh, Pa.)

BLAST FURNACE CONSTRUCTION, STEEL WORKS CONSTRUCTION.

SPECIALTIES:
Gordon's Patent Improved Whitwell-Cowper Stoves, Gordon's Patent Converter for Treating Molten Iron, Improved Regenerative Furnaces, Coke Regenerative Ovens, Blast Furnace Improved Details, Tuyere Stocks and Tuyere Attachments, Boiler Setting giving the Greatest Efficiency, Cinder Car, Kennedy & Gordon's Patents.

QUAKER CITY FACING MILLS.
Send for sample bbl. (Star) Stove Plate Facing. Send for sample bbl. XX Machinery Facing. We Guarantee Perfect Satisfaction.



RIDDLES, SHOVELS, BELLOWS, STEEL WIRE BRUSHES, BRISTLE BRUSHES, And all other Tools used in a Foundry, of our Own Special Make.
J. W. FAXSON & CO.,
DEALERS IN MOULDING SAND, AND MANUFACTURERS OF FOUNDRY SUPPLIES,
Nos. 1015, 1017, 1019 and 1021, or Pier 45 North, Del. Ave., - - - PHILADELPHIA, PA.

EDWARD J. ETTING
IRON BROKER & COMMISSION MERCHANT,
222 S. Third St., PHILADELPHIA, PA.
PIG, BAR AND RAILROAD IRON, OLD RAILS, SCRAP, &c.
Agent for the
Mount Savage Fire Brick.
Eastern Penna., West New Jersey and Delaware.
LYNCHBURG IRON CO.,
LYNCHBURG, VA.
Foundry and Forge Pig Iron.
STORAGE, WHARF AND YARD, Delaware Avenue, above Callowhill St., connected by track with railroad. CASH ADVANCES MADE ON IRON.

JAS. G. LINDSAY, THOS. S. PARVIN, LINDSAY, PARVIN & CO.,
328 Walnut St., Phila.,
Iron and Steel Structural Material
FOR ALL PURPOSES.
Estimates furnished for Iron and Steel Structures and Railway construction. Correspondence solicited with railroad contractors.

L. & R. WISTER & CO.,
IRON COMMISSION MERCHANTS,
257 So. 4th St., Philadelphia.
AGENTS
Kemble and Norway Foundry and Forge Pig Iron. Wyckbrooke C. B. Charcoal Pig Iron. Ferguson Red Short Pig Iron.
DEALERS IN ALL KINDS OF SCRAP IRON.

MORRIS, WHEELER & CO.,
Iron, Steel and Nails.
WAREHOUSE & OFFICES, 16th & Market Sts., PHILA., PA.
SALES OFFICES, 400 Chestnut St., PHILA., PA.
New York Address, 14 CLIFFE ST.

HENRY LEVIS & CO.,
Manufacturers' Agents
For Iron and Steel Rails, Car Wheels, Boiler and Sheet Iron and General Railway Equipments.
Old Rails, Axles and Wheels bought and sold.
294 S. 4th St., Philadelphia.

Frank E. Escherich, Barclay W. Cotton, ESHERICK & CO.,
263 So. 4th St., PHILADELPHIA
Iron and Steel of All Description.
Selling Agents for Cleveland City Forge and Iron Co., Forgings; Central Iron and Steel Works, Plates of Iron and Steel; Danville Nail and Mfg. Co., Iron and Steel Nails, Boiler Tubes; Bridge, Car and Boat Specifications a Specialty.

J. J. MOHR,
430 WALNUT ST., PHILA., PA.,
SOLE AGENT FOR
Sheridan, Leesport, Temple, Lynchburg, Millcreek and Mt. Laurel
Foundry **PIG IRON** and Forge
CHARCOAL PIG IRON.
Also Woodbridge Clay Mining Co.'s Fire Brick.

THE ALLENTOWN ROLLING MILLS,
MANUFACTURERS OF
Rails, Bars, Axles, Shafting, Fish Bars (Plain and Angle), Spikes, Rivets, Bolts and Nuts, &c. Bridges and Turn-Tables.
General Office, 237 South Third St., Philadelphia. Works at Allentown, Pa.

PLYMOUTH ROLLING MILL CO., Conshohocken, PA.
MANUFACTURERS OF
Pig Iron, Foundry and Forge.
Plate and Sheet Steel, Every description of Light Plates and Sheets of Steel.
Plate and Sheet Iron, Best Bloom, Tube, Cleaned, Best Refined, Skelp, Blue Annealed and Common.
Puddled Bars, Special for Axles, Best Neutral and Common.
Particular attention given to Iron for Special Purposes.

TESTED CHAINS.
Bradlee & Co., Empire Chain Works,
816 Richmond St., Philadelphia.
Chains for Foundry Cranes and Slings.
"D. B. G." Special Crane Chain.
Steel and Iron Dredging, Slope and Mining Chains.
Ship's Cables and Marine Railway Chains.

CUMBERLAND NAIL AND IRON CO.,
MANUFACTURERS OF
"CUMBERLAND" NAILS & WROUGHT IRON PIPE,
43 North Water St., and 44 North Delaware Ave., PHILADELPHIA.

J. Tatnall Lea & Co.,
Successors to CABEEN & CO.,
IRON COMMISSION MERCHANTS,
No. 400 Chestnut Street, Philadelphia.
BESSEMER, MILL AND FOUNDRY PIG IRON, SKELP IRON, MUCK AND SCRAP BARS, NATIVE AND FOREIGN ORES. AGENTS FOR CONNELLSVILLE COKE.

BOOTH, GARRETT & BLAIR,
ANALYTICAL AND CONSULTING CHEMISTS,
919 and 921 Chant St. (10th St., above Chestnut St.), Philadelphia, Pa.
Established in 1836.
Analysis of Ores, Waters, Metals and Alloys of all kinds. A special department for the
ANALYSIS OF IRON AND STEEL,
fitted with all the apparatus and appliances for the rapid and accurate analysis of Iron, Steel, Iron Ores, Slags, Limestones, Coals, Clays, Fire sands, &c. Agents for sampling ores in New York and Baltimore. Price lists on application.

JUSTICE COX, JR., CHARLES K. BARNES, JUSTICE COX, JR., & CO.,
AGENTS FOR
CATASAUQUA M'FG. CO.,
Iron, Steel,
Bars, Roller, Tank and Bridge Plates; Skelp, Angles and Shapes; Chirk's, Montgomery, Conewago and Albee Furnaces.
PIG IRON
for Foundries and Mills.
ERIE FORGE CO., Lte. Iron and Steel Forgings; Every shape.
224 South Fourth Street, - Phila., Pa.

Jerome Keeley & Co.,
206 Walnut Place, Phila.,
Selling Agents for CHARCOAL and ANTHRACITE BLOOMS, PIG IRON, BAR IRON, SHEET IRON, STEEL and IRON RAILS, IRON CLAD STEEL RAILS and BARS, MAGNETIC and HEMATITE IRON ORES, FIRE BRICK, COAL and COKE, MUCK RAILS, Handle Old Iron and Steel Rails, Scrap Iron, &c. Examine and negotiate sales of Iron and Coal properties.
E. H. Wilson. A. Kaiser. J. B. M. Hiron.
E. H. WILSON & CO.,
222 and 224 South Third St., Philadelphia,
BROKER AND DEALERS IN
IRON AND STEEL.
Correspondence solicited.

J. W. HOFFMAN & CO.,
IRON COMMISSION MERCHANTS,
208 South Fourth St., Philadelphia.
Selling Agents PINE IRON WORKS, Pine Brand Plates; GLASGOW IRON CO., Plates and Muck Bars; SPIRANG STEEL & IRON CO. (Limited), Siemens-Martin (Open Hearth) Steel, Universal and Sheared Plates, Angles and Shapes.

JNO. L. HOGAN,
IRON COMMISSION MERCHANT,
216 SOUTH FOURTH ST., PHILA.
Pig Iron & Ores, Steel & Iron Blooms.
Agent for Brier Hill Iron and Coal Co., Youngstown Steel Co. Open Hearth Metal, Charcoal Iron, Connelville Coke, Old Rails, Scrap, &c.

Andover Pig Iron FOR BEST MILL PRODUCTS. Andover Chill Iron for Carwheels, &c.
Each Pig marked exact chill depth (5/16 in. to 3/8 in.). A. Whitney & Son's standard test.
F. A. CORLEY, Treas., J. W. LESTLEY PULLMAN, Agent. 240 So. 3d St., Phila.
PEDRO G. SALOM, J. P. L. WESTESSON.
SALOM & WESTESSON,
Philadelphia Testing Laboratory,
208 SOUTH FOURTH STREET, PHILADELPHIA.
Analytical and Consulting Chemists, Assayers and Metallurgists, Physical Testing.
Established 1847.

A. WHITNEY & SONS,
CAR WHEEL WORKS,
PHILADELPHIA.
Special Wheels for Furnace and Mine Cars.

The Effect of Frost on Different Roadways.

There is scarcely any condition of weather which has a more injurious effect upon our thoroughfares than frost, especially should it chance to be, as it was during last winter, of exceptionally long continuance. Every road-maker, says the *Engineer* in a recent article on the subject, is aware of the risks he runs, under such circumstances, of finding that all his efforts toward perfecting the condition of his roads have been negated by such an untoward event, and it seems desirable, at a time when so many arguments are being advanced by the advocates of the several systems which are in use among us, to consider which of them is the least liable to be affected by this dreaded enemy. It is as well to use the words "least liable," because all experience goes to show that there is not one of those systems but what is, under certain conditions, open to injurious action upon it by frost. No one could walk the streets of London, for instance, during the late severe weather without noticing that in some way or another one and all of the street pavings of which this city possesses so many diverse examples had suffered in some degree from its effects. It will be as well to take the cases categorically, and to make reference first to those macadamized roadways which were the first effort of our progenitors toward improving our means of communication.

Intimately connected with this subject is, of course, that of perfect surface drainage. Frost can have but little effect upon any roadway which, retaining its perfect form, and sound as regards its covering, at once throws off all moisture falling upon it. The basis of its operation is thus lost to the frost, and it must prove altogether innocuous. But this is supposing a condition of things which is impossible of realization. No macadamized roadway can, under the exigencies of traffic, be maintained invariably in the state which alone could insure immunity from the injury under consideration. Inequalities must exist in all such road surfaces, affording a lodgment for water in a greater or less degree, and it matters but little what that degree may be. For it is evident from the teaching of all experience that the shallower the water film the more quickly is it acted upon and solidified, while the effect in causing injury to the road surface is fully equal to that which may be due to a greater mass of frozen water. In fact, in the case of macadamized roads it may almost be said that the thicker the ice that is formed the less chance there is of the metal being disturbed by traffic while disjoined, so to speak, from the effect of frost. It is therefore often found that roads of this class which are comparatively in a good state of repair suffer equally, if not even in a greater relative degree, than those which have developed more the results of wear and tear. It is on a form of road construction composed of a mass of units liable to disintegration that frost exercises its most potent effects.

The swelling of the innumerable joints inseparable from Macadam's system quickly forces out of position the metal, however thoroughly it may have been consolidated by steam rolling or by a constant stream of traffic. The binding material itself assumes a condition in which it readily pulverizes to mere dust, and as the result we see the roadway under frost covered with loose metal, and each passing vehicle cutting deeper and deeper into the disturbed mass. Such an effect, it would seem, can never be guarded against on macadamized roads. Their construction is of a character which lends itself greatly to aid in the destructive effect of frost. Nor is it alone the center of the roadway—that is, the portion which bears the traffic—that suffers. Injury is particularly liable to occur from the cause named at the edges of the road unless the side drains where they line the metaling make an almost water-tight joint with it. Indeed, it is in such position that frost often exercises its most injurious action. At such points the metaling is, as a rule, greatly reduced in thickness, and, although it is less exposed to the disrupting effect of traffic, it is more easily permeated by damp from imperfectly cleared side drains, and the thin coat of metal, when that dampness becomes solidified by frost, breaks up almost at once, the debris being thrown into the side drains, causing a further blocking of them and intensifying the means of injury. So serious are the results in such instances that a gentleman well-practiced in road construction held that it would prove economical to combine the system of asphaltizing with that of Macadam. He proposed to lay a width of at least a foot along both sides of his roads with metal bedded in asphalt or other water proof material. But there arose the difficulty that always exists in a combination of systems, that in this case being the impossibility of binding the asphalted line with that of pure macadam work. Weakness at the line of junction would have been sure to show itself, as the degree of expansion and contraction under varying sorts of weather differed, and the plan—effective enough, perhaps, had it stood per se—had to be given up. No amount of precaution that can be exercised with a due regard to economy can, it appears, suffice to guard against the contingency named, or generally to protect the surface of macadamized roads from the injurious effects of frosty weather.

The conditions under which asphalt is employed as a road covering render it much less liable than is macadam to such effects. An asphalt pavement, when perfect, or even comparatively perfect, may be said to be able to resist almost any amount of frost. Considerations of the effect of it in rendering the foothold insecure must, of course, be left out of sight in the matter under present discussion. If the pavement be so far in form as to insure a free discharge of moisture into the gullies (there being no side drains to keep clear of water accumulation), asphalt will undoubtedly remain unaffected by weather which would seriously try macadam. But it suffers under one disadvantage to which the latter system is certainly not exposed. It possesses little or no degree of elasticity. When, therefore, there is a force operating to disruption, and,

ESTABLISHED IN 1848.
SINGER, NIMICK & CO., Ltd.,
 PITTSBURGH, PA.,

MANUFACTURERS OF ALL KINDS OF

HAMMERED AND ROLLED

STEEL.

WARRANTED EQUAL TO ANY PRODUCED.

BEST REFINED TOOL CAST STEEL

For Edge and Turning Tools, Taps, Dies, Drills, Punches, Shear-Knives, Cold-Chisels and Machinists' Tools generally.

SAW PLATES

For Circular, Mulay, Mill, Gang, Drag, Pit and Cross-Cut Saws.

Sheet Steel

For Springs, Billet Web and Hand Saws, Shovels, Cotton Gin Saws, Stamping Cold, &c., &c.

SIEMENS-MARTIN (Open-Hearth) PLATE STEEL

For Boilers, Fire Boxes, Smoke-Stacks, Tanks, &c.

All our Plate and Sheet Steel being rolled by a Patented Improvement, is unequalled for surface finish and exactness of gauge.

ROUND MACHINERY CAST STEEL

For Shafting, Spindles, Rollers, &c., &c.

File, Fork, Hoe, Rake, R. R. Frog, Toe-Calk, Nigh-Shoe and Tire Steel, &c.; Cast and German Spring and Plover Steel.

"Iron Center" Cast Plover Steel. | Finished Rolling Plover Coulters, with Patent Screw Hubs
 "Soft Steel Center" Cast Plover Steel. | Agricultural Steel cut to any pattern desired. [attached.
 "Solid Soft Center" Cast Plover Steel. | Steel Forgings made to order.

Represented a 248 Pearl and 18 Cliff Sts., New York, by

HOGAN & SON, General Agents for Eastern and New England States.

HOGAN & McCARGO, 417 Commerce St., Philadelphia. and FULLER, DANA & FITZ, 110 North St., Boston.



LOCOMOTIVE AND CAR-WHEEL TIRES

Manufactured from the celebrated OTIS STEEL BRAND

STANDARD

Quality and efficiency fully guaranteed. Prices as low as any of the same quality. We manufacture Heavy and Light Forgings, Driving and Car Axles, Crank Pins, Piston Rods, &c.

THE STANDARD STEEL WORKS,

WORKS AT LEWISTOWN, PA.

Office, 220 S. 4th St., Philadelphia, Pa.

FRANKFORD STEEL COMPANY

FRANKFORD, PHILA., PA.,

STEEL RAILROAD AND MACHINE FORGINGS,

SOLID CRUCIBLE STEEL CASTINGS

AND

Best Grades of Tool and Machinery Steel.

MOORHEAD & COMPANY,

Soho Mills, Pittsburgh, Pa., U. S. A.

MANUFACTURERS OF

SHIP, TANK

AND

BRIDGE PLATE,

SKELP

SHEET IRONS,

Special Sizes.

AND

WIDE SHEETS.

Iron, Steel or
COMPOUND

ARMOR PLATES,

UP TO 18 INCHES THICK.

GUARANTEED TO STAND
ADMIRALTY TESTS.

STEEL OR IRON PLATES
FOR MERCHANT VESSELS
OR YACHTS.

Galvanized
Sheets

(Patent Levelled).

Only Manufacturers



And

PLANET Brands.

Open Hearth Steel.

SHIP PLATE, TANK, BOILER, FLANGE and FIRE-BOX.

DOG COLLARS AND FURNISHINGS.



We are the only firm in the world that make the manufacture of Dog Collars and Furnishings their exclusive business, and as such guarantee goods and prices. Send for our illustrated catalogue.

MEDFORD FANCY
GOODS CO.,
207 Broadway, N. Y.

Established 1861.
THOMAS C. BURROWS,
 Agent for Jersey City Steel Company,
 Successors to JAS. R. THOMPSON & CO.

Manufacturers of **STEEL** Of All Descriptions.

WAREHOUSE, 99 and 101 JOHN ST., NEW YORK.

SANDERSON BROS. STEEL CO.,

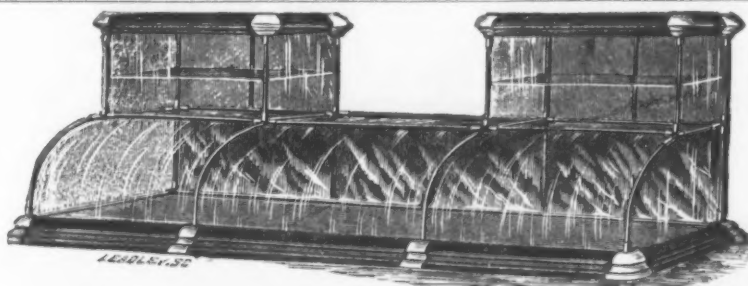
SYRACUSE, N. Y.,

MANUFACTURERS OF THE CELEBRATED

Sanderson Bros. & Co.'s Fine Cast Steel

FOR TOOLS, DIES AND ROCK DRILLS.

Branch Warehouse: 39 Fort Hill Square, Boston.



FARLEY & HOFMAN,

ROCHESTER SHOW CASE WORKS,

Manufacturers of **SHOW CASES** of every description. Highly finished wood cases with patent bell-metal joints a specialty, and the best in the world. Branch stores, 46 West Broadway, New York; 96 Sudbury St., Boston, Mass. Catalogues sent on application. Mention *The Iron Age*. Office and Factory, 29, 31 & 33 Water St., Rochester, N. Y.

INDESTRUCTIBLE

Furnace Lamp,

MADE BY

TAYLOR & BOGGIS

FDY. CO.,

Cleveland, - Ohio.

2 Sizes—3 Pint and 2 Pint.

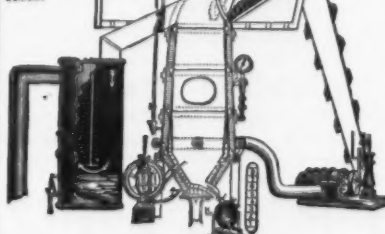
It has no Seams or Solder in
Its Construction.

HARTSFELD PORTABLE SMELTING FURNACE & MINING CO.,

P. O. Box 115, Newport, Ky., U. S. A. Reduction Works, No. 90 and 92 Thornton St.

In sizes from 5 to 60 ton capacity, and the following licensed manufacturers on royalty:

The Engraving represents the Hartfeld Portable Water Jacketed Smelting Furnace, Metal Dust Condenser and a Separator Crucible.



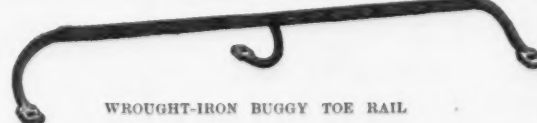
ARMY & CO., London, England and Melbourne, Australia.
 E. A. HUNTINGTON & CO., Chihuahua, Mexico.
 PARKE, LACY & CO., Auckland, and Chili, S. A.
 W. T. GARRETT & CO., San Francisco, Cal., for the Pacific Coast.
 McILVAIN & SPIEGEL, Cincinnati, Ohio.
 Letters Patent have been secured in all principal foreign countries and are sold in shares, trade, royalty or otherwise. Run your eye over this and return answer: silence means no! Catalogue free.

The following companies and firms have ordered plants, as follows: The Kentucky Smelting and Mining Co., of Louisville, Ky., a 30-ton furnace for Idaho; The Santa Barbara Mining and Smelting Co., of Newport, Ky., a 15-ton furnace for Sonora, Mexico; Gasport, Black & Co., of Crooke City, Mont., a 15-ton and a 30-ton furnace; Wright & Homans, of Rapid City, Dakota, a 5-ton furnace. Several others are now awaiting a test of their ores before placing their orders.

MANUFACTURED BY THE

Hartfeld Portable Smelting Furnace and Mining Company,
NEWPORT, KY., - U. S. A.

Write us for
Prices.



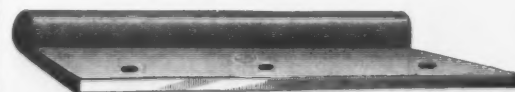
WROUGHT-IRON BUGGY TOE RAIL

The Cleveland Hardware Co., Cleveland, Ohio,

MANUFACTURERS OF

WROUGHT-IRON WAGON, HARDWARE, CARRIAGE and SLEIGH

Rollers of Special Shape Iron.



WROUGHT BUGGY RUB IRON.

WRITE FOR ILLUSTRATED CATALOGUE

ELECTRIC LIGHT.

BRUSH ELECTRIC CO.,

CLEVELAND, OHIO.

WROUGHT IRON

BOILER TUBES.

Steam, Gas and Water Pipe, Oil

Well Tubing, Casing

AND

LINE PIPE.

Cotton Presses, Forgings, Rolling

Mill and General Machinery.

READING IRON WORKS.

261 S. Fourth St., Philadelphia.



FRANKLIN S. MILES,
Manufacturer of
Iron, Steel and German Silver
SCREWS,
205 Quarry St., Philadelphia.

LOVELL ALL CLAMP. ROLLER SKATE!

We Challenge the World to Produce its Equal

Sample Pair sent postpaid on receipt of price.

PRICE, \$6.
Nickel Plated and
Polished.

CHAMPION BREECH-LOADING



SHOT GUN.

Top-Snap Action, Pistol Grip, Rebounding Lock, Patent Fore-end Fastening. For good workmanship, convenience of manipulation, hard and close shooting, durability, and beauty of finish, this Gun has no equal and challenges the world.

PRICES: Plain Barrel, 12 bore, \$15.00; 10 bore, \$16.00.

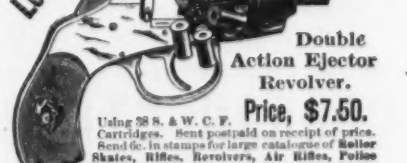
BEAN'S PATENT

Hand Cuff, \$4.75

Cuff, Polished, 4.00

Sent by mail, postpaid, on receipt of price.

Special catalogue of Police Clubs, Hand Cuffs, Leg Irons, Police Rods, Chain Trussers, Pocket Holsters, Police Dark Lanterns, &c. Sent Free on application.



JOHN P. LOVELL'S SONS, Boston, Mass.

Prices to the trade sent on application.

THE HUMPHRIES MFG. CO., MANSFIELD, OHIO,

Manufacturers of
Iron, Brass and Brass-Cyl.
Inder Cistern, Pitcher
Well and Force

PUMPS,

Windmill, Boiler Feed
Horizontal and Rotary
Pumps.

Hydraulic Rams, Iron
and Brass

CYLINDERS
of every description,
and other

HYDRAULIC MACHINERY.

TYRONE IRON CO.,

Works at Tyrone Forges, Blair Co., Penn.

MANUFACTURERS OF
BEST CHARCOAL BLOOMS
and BOILER TUBE SKELP.

ALSO TACK AND NAIL PLATE.

Blooms guaranteed and especially adapted
for stamped ware.

GEO. M. EDDY & CO.

Manufacturers of

Measuring Tapes

of Cotton, Linen and Steel.

FOR ALL PURPOSES.

351 to 353 Nassau Ave., Brooklyn, N. Y.

SILVER & DEMING MANUFACTURING CO.,
Salem, Ohio, U. S. A.,
MANUFACTURERS OF
CISTERN, PITCHER, WELL and
PUMPS
Wind Mill Pumps, Hand and
Power Rotary
Pumps,
HYDRAULIC RAMS,
Boiler Feed Pumps, Garden
Engines, &c.
Also Carriage Makers' Tools,
Blacksmiths' Drills, Butchers'
Tools, and Feed Cutters.
Write for Catalogue and Prices.
English Bros., Kansas City, Mo.,
GENERAL WESTERN AGENTS.
European Agency with SELIG, SONNENTHAL & CO.,
London E. C., England.
PANCOAST & MAULE, Phila., Pa., Eastern Agents.

JOHN MAXWELL,
MANUFACTURER OF PATENTED
BRASS, BRIGHT
TINNED WIRE
& JAPANESE
**BIRD
CAGES.**
The cheapest and
most saleable in
market.
Catalogues and
Price Lists furnished
to the Trade.
247 & 249 Pearl St.,
New York.
Full size of Band for Brass and Tinned Wire Cages.

DUNBAR BROS.,
Manufacturers of
Clock Springs and Small Springs
of every description, from best Cast Steel.
BRISTOL, CONN.

FIELD'S
IMPROVED
FORCE PUMPS.
Latest, Cheapest
and Best.
Household, Orchard
and Well
Force Pumps,
Pitcher Pumps,
Tub Well Pumps.
ECONOMY
Garden Engine.
Send for Catalogue.
Field Force Pump Co.,
Lockport, N. Y.
New England Agency with Fuller, Dana & Fitz,
Boston, Mass.
Western Agency with The Temple Pump Co.,
Chicago, Ill.
Florida Agency with Geo. F. Drew & Co., Jack-
sonville, Fla.

Patterson's Patent Forges
SEVEN SIZES.
Send for Catalogue and Price List.
**BROWN & PATTERSON, Marcy Ave. and Hope Street,
BROOKLYN, N. Y.**

D. S. JENKINS,
Brockton, Mass.,
MANUFACTURER OF
TACKS, BRADS, &c.
We make a full line of goods of first
quality. Write for Price and Sam-
ple. Satisfaction guaranteed.
Goods delivered to points
east of Rocky
Mountains.

Samson Cordage Works.
Solid Braided Window Sash Cord.
The most durable and economical.
Send for Samples to the Manu-
facturers.
J. P. TOLMAN & CO.,
Cor. High and Hamilton Sts. Boston, Mass.

W. & B. DOUGLAS, Middletown, Conn.,
The Oldest and Most Extensive Manufacturers of
Pumps, Hydraulic Rams, Garden Engines,
Yard Hydrants, Street Washers, Galvanized Pump Chain, Wind Mill Pumps
and Other Hydraulic Machines in the World.



Fig. 120.



Fig. 209.



Fig. 70.



Fig. 365.

"THE AQUANETTE,"

shown in the illustration, is a new article we are introducing, designed for showering trees, shrubs, &c., as an insecticide, intended to carry in the hand, with pail on the arm. It will throw a good stream 40 or 50 feet high.

Sent by Express, C.O.D., \$6.00.

LIBERAL DISCOUNT TO THE TRADE.

BRANCH WAREHOUSES:

85 and 87 JOHN STREET, NEW YORK, and 197 LAKE STREET, CHICAGO, ILL.

UNION MANUFACTURING CO.

Sole Manufacturers of

SKINNER'S PATENT COMBINATION CHUCK.

Universal, Independent and Eccentric.

By sliding a stud on the back of Chuck it is instantly changed from Universal to Independent, and vice versa. Each Chuck is guaranteed perfect. All parts are made interchangeable. Only the very best materials used in their construction. Reverse or special Jaws furnished when desired.

We also manufacture
Plain and Ornamental Butts.
Single and Double Acting Spring Hinges,
Union Coil Door Springs,
Galvanized Pump Chain,
Patent Rubber Buckets,
Wooden Well Curbs, Wood Tubing,
Iron and Brass Pumps,
Patent Copper Pumps,
Hydraulic Rams, Power Pumps,
&c., &c., &c.

Write us for prices.

UNION MANUFACTURING CO.,
NEW BRITAIN, CONN.

WAREHOUSE, 103 Chambers Street, New York.

GEORGE BROOKE, President.

GEORGE W. HARRISON, Treasurer.

THE E. & G. BROOKE IRON CO.,
BIRDSBORO, BERKS CO., PA.,
MANUFACTURERS OF

ANCHOR NAILS AND SPIKES. BRAND

Capacity, 1000 Kegs per Day.

Made from their own Pig Iron, Insuring Regularity and Superiority in Quality.

ALSO

**FOUNDRIY AND FORGE PIG IRON,
AND COLD BLAST CHARCOAL CAR WHEEL IRON.**

OLD DOMINION CUT NAILS, BAR IRON.

R. E. BLANKENSHIP, President,
RICHMOND, VA.

IRON AND STEEL DROP FORGINGS

All shapes, small and large, including
GUN, PISTOL, WRENCH BARS, &c. ALSO, DIE SINKING. MANUFACTURERS ALSO
OF BRICKLAYERS' MOULDERS' AND PLASTERERS' TOOLS,
SADDLERS' BOUND AND HEAD KNIVES.

WILLIAM ROSE & BROS.,
36th & Filbert Sts., WEST PHILADELPHIA.

NATIONAL HARDWARE & MALLEABLE IRON WORKS.

Lehigh Avenue, American and Third Streets, Philadelphia.

THOMAS DEVLIN & CO.,

MALLEABLE, FINE GRAY IRON AND STEEL CASTINGS made from patterns to order. Special attention given to Tinning, Bronzing, Coppering, Japanning and Fitting. A large line of Carriage and Wagon Castings constantly on hand for the trade.



**C. F. RICHARDSON, ATHOL, MASS., Manufacturer of
IRON LEVELS.**

assuming this to have obtained a fulcrum for action, there is not with asphalt, as there is with macadam, a function enabling it for a while to resist that force. Supposing this to be sufficiently intensified, the effect is immediate and the injury widespread. The latter must go on extending so long as the frost continues or preventive measures are delayed, and the result is far more ruinous than in the case of metalled roads. Now it is certain that there do occur repeated instances where frost has obtained the fulcrum referred to. Asphalt paving much worn by traffic becomes dangerously thin upon its concrete bed, eventually cracks, and then admits water between it and its foundation. Frost then occurring causes the permeated moisture to swell, and upheaval of the exposed edges follows; further sub-permeation then takes place and the asphalt comes up in large masses. Nothing, it may be conceived, can guard against such contingency if the pavement is once allowed to become so thin as to be liable to crack under weight. Asphalt is particularly free from any such tendency at a moderate degree of temperature; but under a low range of the thermometer it becomes exceedingly brittle, and therefore particularly liable to such an accident. It has been suggested that the very hardness of the asphalt used in street paving is opposed to its economical employment. Injury to this material is almost unknown during the warm summer months, when it possesses a certain modicum of that elasticity which, as has been said, is wanting to it under the wider range of conditions.

The question as to how it has been put is whether it would not be possible by admixture to give it a degree of that quality which, while tending to preserve it during frosty weather, would not adversely affect its traffic-bearing properties. Is it, it is asked, wise to use an entirely unyielding material to carry road traffic? There is an analogy to a certain extent between an asphalt roadway and the solid concrete roof coverings used in Eastern countries. The more solid and unyielding the character of these coverings the more certain are they to crack from the contraction and expansion and consequent movement of the beams which support them. This difficulty appears to have been overcome by those dealing with such roofs by filling in the lines of cleavage where they have showed themselves by a mixture of tar and tallow. Those lines of cleavage once established rarely diversify themselves, and the elastic character of the filling-in material employed enables them to widen or close up without further injury or without admitting water. It cannot, of course, be said that such a method is applicable to roadways, but it may be admitted that it at least proves the danger of using inelastic material under circumstances which must expose it to disrupting influences. Every roadway is liable to these, and, if a mixture could be made which would preserve to asphalt when exposed to low temperature even the small degree of elasticity it possesses at a higher range, it is to be believed that much of the danger now due to the action of frost upon it when used for road surfaces would be done away with. Whether this is possible to be done without militating against the traffic-bearing qualities of hard asphalt present experience does not prove, but experiment in this direction would not be thrown away.

Wood paving combines in a great degree certain of the peculiarities of both the two systems previously considered. As is macadam, so is wood paving an aggregation of units liable to the same disturbing influences, though in lesser degree, while, like asphalt, it has no perfect union with its foundation, and is therefore similarly liable to the effect of damp getting below it and being acted upon by frost; but it possesses in an eminent degree the quality of elasticity named as being wholly absent in asphalt paving, while the lesser number of joints as compared with macadam enables them to be treated with a material of a more water-proofing character than is possible with the last-named form of work. But then, on the other hand, the main material employed is essentially porous, and in its untreated condition readily admits of the permeation of damp. Of late years, it may be observed, there has been a tendency to lay such roadways with wood blocks wholly unsubjected to any process of water-proofing. This may be economical in first cost, but it must prove fatal to that quality in the long run. Frequenters of Fleet street would have probably observed the results to such a method which were apparent in the case of portions of its roadway laid not long since with uncreosoted wood. Under the influence of the frost the whole roadway in places was upheaved bodily, with what after-results in a financial sense can be easily imagined. In a climate such as ours it must without doubt be one of the primary considerations in laying down any road paving that it should be able to withstand in the fullest possible manner the effect of our constant rainfall. The practice above referred to is in direct negative of such a manifest precaution. To neglect this is to co-operate with the frost in performing its destructive work; and no idea of saving in first cost should be allowed to induce neglect of guarding against after injury.

But there is another point of view which has also lately received strong illustration, from which the effect of frost on wood paving may be considered. The elasticity of this system has before been referred to, but it is, as at present treated, limited to the wood portion of it only. The joints, as now filled in, are eminently inelastic, the asphalt employed being as deficient, of course, in that quality as has been pointed out in relation to paving wholly composed of it. It is certain that wood blocks, especially if uncreosoted or untreated by some other method of water-proofing, must constantly vary, both in shape and size, during changes of weather. But the movement so caused cannot be followed by the rigid material employed for filling the joints. Hence it must follow that at certain periods there must be found interstices through which damp may percolate from the surface between the blocks and their bed. The arguments advanced in favor of elasticizing—to coin a word—this material have, therefore, additional strength in this relation. Intimately associated with

this particular phase of the subject is the question of accurate laying of wood blocks, so as to insure perfect uniformity in the width of the joints. If this varies the causes above named operate with increased strength; the blocks become loosened, shift position and lose all the quality of bonding with those adjacent which so greatly adds to the solidity of a pavement. An instance in which the neglect of this common-sense precaution is strongly evident is noticeable in Pall Mall. Cheapness seems to have been the only thought with those responsible for the laying of the wooden roadway in that thoroughfare. The blocks were literally almost thrown together, and the result after the late frost should prove a caution for the future against any repetition of such false economy in work of this description. It is not too much to say that the state of the Pall Mall pavement is a disgrace to a city like London. Its center was not many months back, after but a very brief life, taken up and relaid, but the portions of it on either side are really dangerous to traffic, as is almost daily proved by the accidents which occur upon it. That much of its present condition is due to the exceptional opportunity it had laying offered to the action of recent frosts upon the damp accumulated below it cannot be gainsaid. A wood pavement to resist that action must consist primarily of blocks through which damp cannot penetrate. Secondly, its joints must be accurately laid and of as little width as may be possible consistently with allowing some expansion of the blocks without producing a disrupting effect, and, thirdly, if it be possible to do so, these joints should be filled with material of a less rigid character than hard asphalt. Elasticity is a condition to the long life of a railroad track, as well as to that of the rolling stock. Equally desirable is it that the same quality should as far as possible be secured for ordinary roadways.

There remains but one system of construction to be dealt with—that of paving formed of stone pavers. As regards the liability of it to injury by frost, it combines the weaknesses of both macadam and wood paving, without the advantages in other respects which are patent in both of those systems. However carefully laid, it can never be said to approach the condition of being perfectly water-tight. The grouting it receives, especially as this is commonly applied, certainly never insures that quality, and although the blocks themselves, and consequently the major portion of the road surface, do possess it, the joints may be said always more or less to leak, and the result under frost must follow the rules above quoted. This form of paving is exposed to yet another disability almost peculiar to itself. The grouting under the effects of frost becomes exceedingly friable. With the best workmanship employed and the best material there must always be a certain degree of movement in the blocks under heavy or rapid traffic. When the filling-in material is in the state described this motion acts upon it most destructively, and the defect nullifies the one advantage possessed by stone—that it does not contract or expand appreciably under varying temperatures or climatic conditions. Perhaps to that advantage may be added one other—that of weight as opposing itself to the swelling action of frost; but it must be manifest that it is only when this last is of a very restricted power that such a qualification can be said to possess any advantage.

To sum up the result of what has been written, it may be concluded that all the various forms of paving roadways as at present practiced offer themselves with individual peculiarities to the destructive effects of frost. As immunity from percolation between the material and its bed is the chief safeguard from these, the asphalt paving may certainly be placed first in its qualifications for resisting them, though it has been pointed out that this pavement is not free from a particular danger. The three other systems seem to rank pretty much on a parity; but while the case of macadam seems to be hopeless for improvement, it is certain that in that of wood, at all events, more careful laying and the use of some more elastic material for filling in the joints would go a long way toward enabling it to resist the action of our severe winter frosts.

Ordinance Supplies.

The following is the bid of the Midvale Steel Co., of Philadelphia, Pa., on steel forgings for the Ordnance Department: 10 and 12 inch forgings for breech block, 44 cents per pound; 8-inch forgings for breech block, 75 cents per pound; forgings for spindle, 54 cents per pound; forgings for race plate, 64 cents per pound; forgings for block carrier, 80 cents per pound; forgings for lever, 64 cents per pound; forgings for hinge-pins, 64 cents per pound; forgings for bushing ring, 45 cents per pound; forged bar for securing rings, 64 cents per pound, and forgings for gas-check rings, 64 cents per pound.

The same company put in the following bid on mortar hoops: Rolled hoops, 36 cents per pound; trunnion hoops, \$1 per pound.

The bid for furnishing cannon, carriages, &c., was as follows: Hotchkiss & Co., six Hotchkiss revolving cannon, 37 mm. caliber (1.45 in.), \$7500; carriages, \$3000; limbers, \$2250; acccessions in reserve parts for guns and carriages, \$1050; ammunition wagons, \$4500; acccessions for wagons, \$600; loading tools, \$100; percussion shells, fuse, cartridge case, and wad, \$1 each; canister shot, 62 cents each.

The following are the bids on cored shot: West Point Foundry Association—shot, \$20 each; copper bands, \$2.25 each. South Boston Iron Works, Boston, Mass.—\$30.30 and \$2. Talbot & Sons, Richmond, Va.—\$30 and \$2. Tredegar Co., Richmond—\$60 and \$3.

The bids for supplying the army with a cast-iron body for a 12-inch mortar were: South Boston Iron Works, Boston, Mass., \$3500; Builders' Iron Foundry, Providence, R. I., \$5000.

A curious instance of the ambition of new traders is offered by the following item from an English newspaper: Daniell, Marks & Co., Limited, is the title of a company

Paris, 1878.

McCAFFREY & BRO.,

PENNSYLVANIA FILE WORKS,

Philadelphia, Pa., U. S.

Manufacture and keep in stock a full line of **FILES** and **RASPS** only, for which we claim special advantages over the ordinary goods, and ask domestic and foreign buyers to allow us to compete for their trade.

Superiority acknowledged wherever used, sold or exhibited.

GAY & PARSONS,

MANUFACTURERS OF THE

Double-Action Ratchet Screw Driver.

ONE OF THE VERY BEST TOOLS EVER INVENTED.



The above Cut shows the action or mechanism complete, also an end view of the Ratchet and Pawls, to which we wish particularly to call your attention, as in all ratchet movements, of whatever kind or nature, the **RATCHET** must be the principal and most important part employed.

It combines greater Strength,

Convenience and Durability than can be obtained in a common Driver.

FOR CIRCULARS AND PRICES, ADDRESS OUR AGENTS

JOHN H. GRAHAM & CO.,

113 Chambers Street, NEW YORK.

CORRUGATED

IRON ROOFING

SIDING, CEILING, ARCHES AND LATH.

CINCINNATI CORRUGATING CO.

CINCINNATI, O.

SEND FOR ILLUSTRATED CATALOGUE.

CRIMPED

LIGHTNING HAY KNIVES. WEYMOUTH'S PATENT.

This knife is the best in use for cutting down hay and straw in mow and stack, cutting fine feed from bale, cutting corn stalks for feed, cutting peat and ditching marshes.

The blade is best cast steel, spring temper, easily sharpened, and is giving universal satisfaction. A few moments' trial will show its merits, and parties once using it are unwilling to do without it. Its sales are fast increasing for export as well as home trade, and it seems destined to take the place of all other Hay Knives.

They are nicely packed in boxes, one dozen each of 60 pounds weight, suitable for shipping by land or water to any part of the world.

MANUFACTURED ONLY BY

HIRAM HOLT & CO., East Wilton, Franklin Co. Maine.

For sale by the Hardware trade generally.

CAUTION:

We are informed that various parties are infringing upon the widely known Letters Patent granted originally to George F. Weymouth for an improved Hay Knife.

The characteristic feature of the invention is a curved blade, provided with saw-tooth cutters, and furnished with suitable working handles. It is our purpose to prosecute all infringements, and to hold responsible to the full extent of our ability and of the law all parties who manufacture any knife infringing upon the patent, or who deal in the same. Several suits have been already ordered.

All manufacturers and dealers are hereby warned of our rights, and the public are cautioned against purchasing any Hay Knives which are not of our genuine manufacture.

HIRAM HOLT & CO.

EAST WILTON, May 10, 1886.

TACKS

TACKS AND STAPLES

A COMPLETE LINE OF

Double Pointed & Steel Wire Tacks, Blind, Bed Spring, Telephone & other Staples.

The Large Head 2 1/4 x 1 1/2 Full Weight.

Steel Wire Tacks Uniform, Dbl. Uniform are put up either in Assorted 100 papers.

Outside of all combinations.

Send for Catalogue.

Worcester Tack & Staple Co.

S. H. LARNED.

Worcester, Mass.

S

RIPLEY & BARTLETT, TACKS

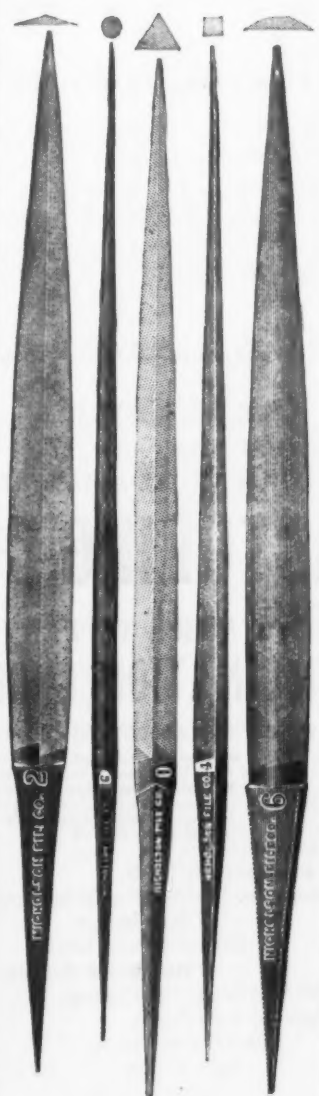
MANUFACTURERS OF

Swedes and American Iron Tacks of All Kinds.

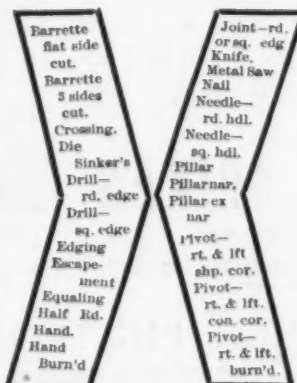
TRUNK AND CLOUT NAILS

A SPECIALTY.

Any variation from regular sizes and shapes made to order from samples.

WORKS AT
PLYMOUTH, MASS.**TACKS & WIRE NAILS**BOSTON SALESROOM,
70 Portland St.BALTIMORE SALESROOM,
73 German St.NEW YORK SALESROOM,
116 Chambers St.**AMERICAN TACK CO., Fairhaven, Mass.****Nicholson FILES.**

OUR [X F] FILES.



Ratchet, Round
Round
Straight
Screw
Head
Screw
Head
Tanged
Square, Slim
Slitting
Three Sq.
Three Sq.
Metal
Saw
Warding

NICHOLSON FILE CO.,

PROVIDENCE, R. I.

Sole Manufacturers.

BLACK DIAMOND FILE WORKS.**G. & H. BARNETT,**

21 to 43 RICHMOND STREET, - - - PHILADELPHIA.

CHARLES B. PAUL, MANUFACTURER OF HAND CUT FILES,

Warranted Cast Steel.

187 Tenth St., Williamsburgh, N. Y.

All descriptions of Files made to order. Price List mailed on application.

Established 1863.

THRIFT FILE WORKS,
Manufacturers of all kinds of
FILES, RASPS.

CHRISTIAN HENSLER,
438, 439, 440 & 441 Ireland St., PHILA., PA.
HERRING & SWEASEY, Agents in New York, 102 Chambers St.

McClellan File Co.,

113 So. Water St.,

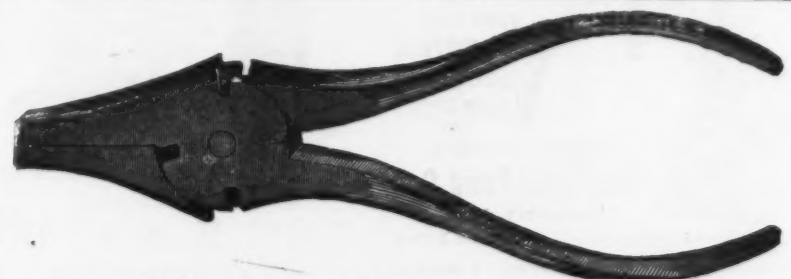
E. Saginaw, Mich.

TACK AND SHOE NAIL MACHINERY.
WM. A. SWEETSER.
Brockton, Mass.

HELLER & BROS., NEWARK, N. J.

Manufacturers of the
CELEBRATED AMERICAN HORSE RASPS, FILES, FARRIERS' TOOLS AND FINE CAST STEEL.

Made of solid best CLAY CRUCIBLE CAST STEEL of our own manufacture and warranted to be unequalled in the market. For sale by Iron and Hardware dealers throughout the United States and Canada.

**J. M. KING & CO.,**

WATERFORD, N. Y.

Manufacturers of the

Button's Pat. Wire Cutter and Plier Combined.

Specially Adapted for Use on Wire Fence.

Also Manufacturers of BLACKSMITHS' and MACHINISTS' STOCKS and DIES; FLUG and TAPER TAPS, HAND, NUT and SCREW TAPS, PIPE TAPS and REAMERS.

Price List on Application.

Established by DANIEL B. KING, 1829.

LIGGETT SPRING AND AXLE CO., LIMITED,
MANUFACTURERS OF
Springs and Axles

For Coaches, Phaetons, Buggies, Wagons, &c

PITTSBURGH, PA.**UNION FOUNDRY AND PULLMAN CAR WHEEL WORKS,****GEORGE M. PULLMAN, President.**

CORRESPONDENCE SOLICITED AND ESTIMATES MADE ON

HEAVY MACHINERY, AND ALL SIZES OF FLY WHEELS, PULLEYS, &c.

Special Machinery for Grain Elevators, Grain Steam Shovels, &c., contracted for. Car Wheels and Car Castings at lowest rates.

604 Pullman Building, Chicago.

RIEHLÉ BROS.

STANDARD

SCALES
AND
TESTING MACHINESRAILROAD TRACK SCALES.
Best and Cheapest.

Cleveland Iron Ore Paint Co.

MANUFACTURERS OF

PURE IRON ORE PAINTS,

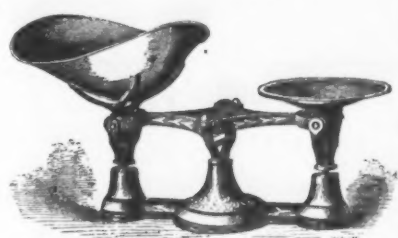
Red (Rosie), Purple and Brown. We guarantee all our paints, and respectfully solicit the patronage of consumers and dealers. Our paints are used largely by the railroads and car builders of our country. Send for Price List No. 13.

OFFICE: 154 MERWIN ST., CLEVELAND, O.

BEST IRON PAINT.

SCALES

Of All Descriptions



FOR

Grocers' & Family Use.

Manufactured by

JOHN CHATILLON & SONS,

85, 87, 89 Cliff Street, New York.

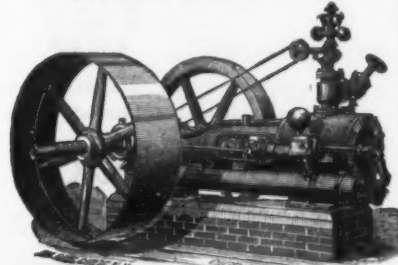
Send for Illustrated Price List.

IF YOU WANT A STRONG, ECONOMICAL

ENGINE,

Either HORIZONTAL or VERTICAL,
For steady every-day and all-night service and
at a LOW PRICE, write to

COOKE & CO.,
22 Cortlandt Street, NEW YORK.



Twelve hundred Engines in use.
Please mention this paper.

REFRIGERATORS

AND CREAMERIES.

GET
THE
BEST.

THE LEONARD

CLEANABLE with Movable Flues, Solid Air, Carved and Ornamented, TRIPLE WALLED, CHARCOAL FILLED and METAL LINED, making Five Walls in all. Solid Iron Shelves and Air-Tight Locks. Outlets all others at sight on its merits alone. Secure the agency and capture the sales. Don't fail to write for Catalogue.



GRAND RAPIDS REFRIGERATOR CO.,
GRAND RAPIDS, MICH.
New York Warehouse, No. 106 Chambers St. Francis T. Witte Hdw. Co., Sole Agents. Samples and Stock for Eastern trade constantly on hand.



J. M. STUTZMAN,

181 William St. New York,

Manufacturer of

Steel Alphabets

DIE LETTERS FOR SEAL

ENGRAVERS.

BRANDS, SEALS,

POST-OFFICE STAMPS,

Door Plates,

Steel Stencil-Cutting Dies,

Soap Moulds and Brass

Stamps.

SEND FOR PRICE LIST.

A NOVELTY IN SHOVELS.

MAYNARD'S

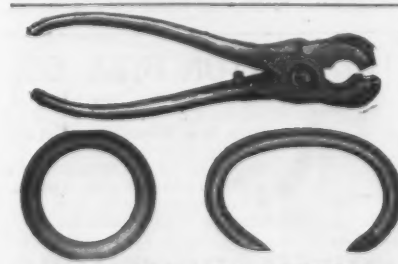
PATENT SOLID CAST STEEL SOCKET

SHOVELS AND SPADES.

Forged from a single piece of Cast Steel, without welding. The best, strongest and handiest ever made. For sale by

GEO. W. BRUCE,

1 Platt Street, New York.



BLAIR'S PATENT

Hog and Pig Ringer.

Will close Ring outside nose if so desired. Millions in use. Ring production daily, 80,000.

E. BLAIR,

BUYRUS, OHIO.

CHEMICALS AND APPARATUS

FOR THE ANALYSIS OF

Ores, Iron, Steel, Fuel, Fluxes, Furnace Gases, &c., our specialty.

Being direct Importers and Manufacturers, we can offer superior inducements. Sole Agents for
Trommsdorff's Chemicals; Joseph Kavalier's
Superior Bohemian Glass; Schleicher & Schuell's
Chemically Pure and Common Filter Paper;
E. March Soehne's, Acid Proof German Stoneware
Professor Jolly's Spiral Balances.

SPECIALTIES:
Strictly Chemically Pure Acids and Chemicals.
Platinum in all its shapes. Glass Blowing and
Engraving in all its branches. Superior
German Porcelain, Balances, Weights,
Testing Apparatus.



EIMER & AMEND, Nos. 205 to 211 Third Avenue, New York.
18th St. Station Elevated R. R.

ILLUSTRATED CATALOGUE MAILED ON APPLICATION.



Wrought Iron.
Anti-Friction.

IT EXCELS ALL OTHERS

Security of Door.
Strength of Material.
Ease of Motion.
Simplicity of Application.

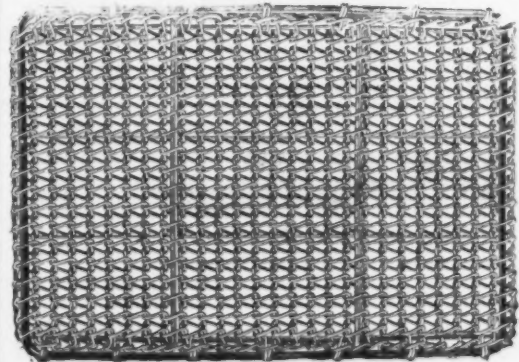
THIS HANGER

Requires no Oil.
Has no Flanged Wheels.
Packs snugly for Shipment.

SELLS BEST.

VICTOR
MFG. CO.,
Newburyport, Mass.

HARTMAN



THE PATENT
Steel Wire Door Mat.

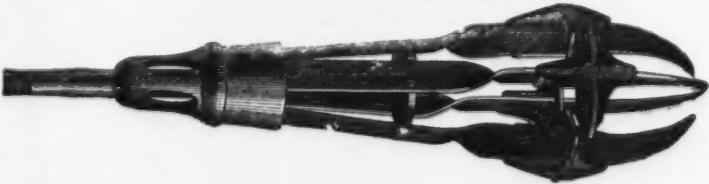
The Greatest Thing in the Way
of a Mat Ever Devised.

Made from steel wire, with steel frames and steel braces, all perfectly galvanized. Indestructible, cleanly, cheap. Adapted for any and every place where a mat or a matting is needed.

HARTMAN STEEL CO., Limited,
BEAVER FALLS, PA.

BOSTON: 74 India Street. NEW YORK: 90 Chambers Street. PHILADELPHIA: 413 Commerce Street. CHICAGO: 72 W. Lake Street.

THE NATIONAL STEEL TUBE CLEANER,
FOR CLEANING BOILER TUBES.



ENDORSED BY THE BEST ENGINEERS.

THE CHALMERS-SPENCE CO.,
419 East 8th Street, New York.

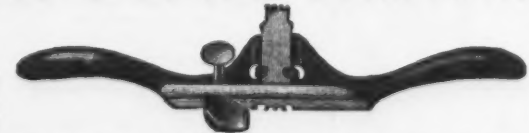
STANLEY RULE & LEVEL COMPANY,

MANUFACTURERS OF
IMPROVED

CARPENTERS' TOOLS.

FACTORIES:
NEW BRITAIN,
CONN.

WAREHOUSES:
29 Chambers Street,
NEW YORK.



STANLEY UNIVERSAL HAND BEADER.

For Beading, Reeding or Fluting straight or irregular surfaces this tool is invaluable to wood-workers. Six superior steel cutters go with each tool. Both ends are sharpened, thus embracing six ordinary sizes of Beads, four sets of Beads and two Fluters. The cutter is firmly clamped to the stock. A gauge with long straight bearing surfaces is used in ordinary work, and a gauge with oval bearing surfaces is used for curved or irregular forms of work. No. 66. Iron Stock, with six Steel Cutters.....\$1.00

THE WALKLEY HARDWARE CO., Plantsville, Conn.,
MANUFACTURERS OF

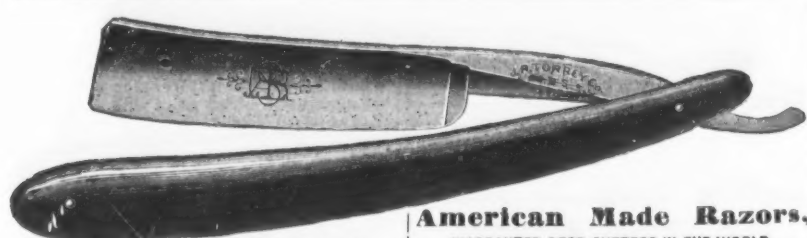
TACKS, BRADS, &c.

We call the attention of the Trade to our "Diamond" and "Circle" brand Steel Carpet Tacks. "Diamond" brand, Uniform Weights; "Circle" brand, Double Uniform Weights: 6, 8, 10, 12, 14, 16 ounce "Diamond" brand, list, Blued, 37 1/2c; Tinned, 50c. "Circle" brand, list, Blued, 7 1/2c; Tinned, \$1.00. Warranted equal to Swedes in all essentials.



THE FORSTNER AUGER BIT,

For boring Smooth, Round, Oval or Square Surface holes. For fine Carpenter, Cabinet and Pattern work. Sizes in Eighths: 3/8, 1/2, 5/8, 3/4, 7/8, 1, 1 1/8, 1 1/4, 1 1/2, 1 3/4, 1 7/8, 2, 2 1/4, 2 1/2, 2 3/4, 3, 3 1/4, 3 1/2, 3 3/4, 4, 4 1/4, 4 1/2, 4 3/4, 5, 5 1/4, 5 1/2, 5 3/4, 6, 6 1/4, 6 1/2, 6 3/4, 7, 7 1/4, 7 1/2, 7 3/4, 8, 8 1/4, 8 1/2, 8 3/4, 9, 9 1/4, 9 1/2, 9 3/4, 10, 10 1/4, 10 1/2, 10 3/4, 11, 11 1/4, 11 1/2, 11 3/4, 12, 12 1/4, 12 1/2, 12 3/4, 13, 13 1/4, 13 1/2, 13 3/4, 14, 14 1/4, 14 1/2, 14 3/4, 15, 15 1/4, 15 1/2, 15 3/4, 16, 16 1/4, 16 1/2, 16 3/4, 17, 17 1/4, 17 1/2, 17 3/4, 18, 18 1/4, 18 1/2, 18 3/4, 19, 19 1/4, 19 1/2, 19 3/4, 20, 20 1/4, 20 1/2, 20 3/4, 21, 21 1/4, 21 1/2, 21 3/4, 22, 22 1/4, 22 1/2, 22 3/4, 23, 23 1/4, 23 1/2, 23 3/4, 24, 24 1/4, 24 1/2, 24 3/4, 25, 25 1/4, 25 1/2, 25 3/4, 26, 26 1/4, 26 1/2, 26 3/4, 27, 27 1/4, 27 1/2, 27 3/4, 28, 28 1/4, 28 1/2, 28 3/4, 29, 29 1/4, 29 1/2, 29 3/4, 30, 30 1/4, 30 1/2, 30 3/4, 31, 31 1/4, 31 1/2, 31 3/4, 32, 32 1/4, 32 1/2, 32 3/4, 33, 33 1/4, 33 1/2, 33 3/4, 34, 34 1/4, 34 1/2, 34 3/4, 35, 35 1/4, 35 1/2, 35 3/4, 36, 36 1/4, 36 1/2, 36 3/4, 37, 37 1/4, 37 1/2, 37 3/4, 38, 38 1/4, 38 1/2, 38 3/4, 39, 39 1/4, 39 1/2, 39 3/4, 40, 40 1/4, 40 1/2, 40 3/4, 41, 41 1/4, 41 1/2, 41 3/4, 42, 42 1/4, 42 1/2, 42 3/4, 43, 43 1/4, 43 1/2, 43 3/4, 44, 44 1/4, 44 1/2, 44 3/4, 45, 45 1/4, 45 1/2, 45 3/4, 46, 46 1/4, 46 1/2, 46 3/4, 47, 47 1/4, 47 1/2, 47 3/4, 48, 48 1/4, 48 1/2, 48 3/4, 49, 49 1/4, 49 1/2, 49 3/4, 50, 50 1/4, 50 1/2, 50 3/4, 51, 51 1/4, 51 1/2, 51 3/4, 52, 52 1/4, 52 1/2, 52 3/4, 53, 53 1/4, 53 1/2, 53 3/4, 54, 54 1/4, 54 1/2, 54 3/4, 55, 55 1/4, 55 1/2, 55 3/4, 56, 56 1/4, 56 1/2, 56 3/4, 57, 57 1/4, 57 1/2, 57 3/4, 58, 58 1/4, 58 1/2, 58 3/4, 59, 59 1/4, 59 1/2, 59 3/4, 60, 60 1/4, 60 1/2, 60 3/4, 61, 61 1/4, 61 1/2, 61 3/4, 62, 62 1/4, 62 1/2, 62 3/4, 63, 63 1/4, 63 1/2, 63 3/4, 64, 64 1/4, 64 1/2, 64 3/4, 65, 65 1/4, 65 1/2, 65 3/4, 66, 66 1/4, 66 1/2, 66 3/4, 67, 67 1/4, 67 1/2, 67 3/4, 68, 68 1/4, 68 1/2, 68 3/4, 69, 69 1/4, 69 1/2, 69 3/4, 70, 70 1/4, 70 1/2, 70 3/4, 71, 71 1/4, 71 1/2, 71 3/4, 72, 72 1/4, 72 1/2, 72 3/4, 73, 73 1/4, 73 1/2, 73 3/4, 74, 74 1/4, 74 1/2, 74 3/4, 75, 75 1/4, 75 1/2, 75 3/4, 76, 76 1/4, 76 1/2, 76 3/4, 77, 77 1/4, 77 1/2, 77 3/4, 78, 78 1/4, 78 1/2, 78 3/4, 79, 79 1/4, 79 1/2, 79 3/4, 80, 80 1/4, 80 1/2, 80 3/4, 81, 81 1/4, 81 1/2, 81 3/4, 82, 82 1/4, 82 1/2, 82 3/4, 83, 83 1/4, 83 1/2, 83 3/4, 84, 84 1/4, 84 1/2, 84 3/4, 85, 85 1/4, 85 1/2, 85 3/4, 86, 86 1/4, 86 1/2, 86 3/4, 87, 87 1/4, 87 1/2, 87 3/4, 88, 88 1/4, 88 1/2, 88 3/4, 89, 89 1/4, 89 1/2, 89 3/4, 90, 90 1/4, 90 1/2, 90 3/4, 91, 91 1/4, 91 1/2, 91 3/4, 92, 92 1/4, 92 1/2, 92 3/4, 93, 93 1/4, 93 1/2, 93 3/4, 94, 94 1/4, 94 1/2, 94 3/4, 95, 95 1/4, 95 1/2, 95 3/4, 96, 96 1/4, 96 1/2, 96 3/4, 97, 97 1/4, 97 1/2, 97 3/4, 98, 98 1/4, 98 1/2, 98 3/4, 99, 99 1/4, 99 1/2, 99 3/4, 100, 100 1/4, 100 1/2, 100 3/4, 101, 101 1/4, 101 1/2, 101 3/4, 102, 102 1/4, 102 1/2, 102 3/4, 103, 103 1/4, 103 1/2, 103 3/4, 104, 104 1/4, 104 1/2, 104 3/4, 105, 105 1/4, 105 1/2, 105 3/4, 106, 106 1/4, 106 1/2, 106 3/4, 107, 107 1/4, 107 1/2, 107 3/4, 108, 108 1/4, 108 1/2, 108 3/4, 109, 109 1/4, 109 1/2, 109 3/4, 110, 110 1/4, 110 1/2, 110 3/4, 111, 111 1/4, 111 1/2, 111 3/4, 112, 112 1/4, 112 1/2, 112 3/4, 113, 113 1/4, 113 1/2, 113 3/4, 114, 114 1/4, 114 1/2, 114 3/4, 115, 115 1/4, 115 1/2, 115 3/4, 116, 116 1/4, 116 1/2, 116 3/4, 117, 117 1/4, 117 1/2, 117 3/4, 118, 118 1/4, 118 1/2, 118 3/4, 119, 119 1/4, 119 1/2, 119 3/4, 120, 120 1/4, 120 1/2, 120 3/4, 121, 121 1/4, 121 1/2, 121 3/4, 122, 122 1/4, 122 1/2, 122 3/4, 123, 123 1/4, 123 1/2, 123 3/4, 124, 124 1/4, 124 1/2, 124 3/4, 125, 125 1/4, 125 1/2, 125 3/4, 126, 126 1/4, 126 1/2, 126 3/4, 127, 127 1/4, 127 1/2, 127 3/4, 128, 128 1/4, 128 1/2, 128 3/4, 129, 129 1/4, 129 1/2, 129 3/4, 130, 130 1/4, 130 1/2, 130 3/4, 131, 131 1/4, 131 1/2, 131 3/4, 132, 132 1/4, 132 1/2, 132 3/4, 133, 133 1/4, 133 1/2, 133 3/4, 134, 134 1/4, 134 1/2, 134 3/4, 135, 135 1/4, 135 1/2, 135 3/4, 136, 136 1/4, 136 1/2, 136 3/4, 137, 137 1/4, 137 1/2, 137 3/4, 138, 138 1/4, 138 1/2, 138 3/4, 139, 139 1/4, 139 1/2, 139 3/4, 140, 140 1/4, 140 1/2, 140 3/4, 141, 141 1/4, 141 1/2, 141 3/4, 142, 142 1/4, 142 1/2, 142 3/4, 143, 143 1/4, 143 1/2, 143 3/4, 144, 144 1/4, 144 1/2, 144 3/4, 145, 145 1/4, 145 1/2, 145 3/4, 146, 146 1/4, 146 1/2, 146 3/4, 147, 147 1/4, 147 1/2, 147 3/4, 148, 148 1/4, 148 1/2, 148 3/4, 149, 149 1/4, 149 1/2, 149 3/4, 150, 150 1/4, 150 1/2, 150 3/4, 151, 151 1/4, 151 1/2, 151 3/4, 152, 152 1/4, 152 1/2, 152 3/4, 153, 153 1/4, 153 1/2, 153 3/4, 154, 154 1/4, 154 1/2, 154 3/4, 155, 155 1/4, 155 1/2, 155 3/4, 156, 156 1/4, 156 1/2, 156 3/4, 157, 157 1/4, 157 1/2, 157 3/4, 158, 158 1/4, 158 1/2, 158 3/4, 159, 159 1/4, 159 1/2, 159 3/4, 160, 160 1/4, 160 1/2, 160 3/4, 161, 161 1/4, 161 1/2, 161 3/4, 162, 162 1/4, 162 1/2, 162 3/4, 163, 163 1/4, 163 1/2, 163 3/4, 164, 164 1/4, 164 1/2, 164 3/4, 165, 165 1/4, 165 1/2, 165 3/4, 166, 166 1/4, 166 1/2, 166 3/4, 167, 167 1/4, 167 1/2, 167 3/4, 168, 168 1/4, 168 1/2, 168 3/4, 169, 169 1/4, 169 1/2, 169 3/4, 170, 170 1/4, 170 1/2, 170 3/4, 171, 171 1/4, 171 1/2, 171 3/4, 172, 172 1/4, 172 1/2, 172 3/4, 173, 173 1/4, 173 1/2, 173 3/4, 174, 174 1/4, 174 1/2, 174 3/4, 175, 175 1/4, 175 1/2, 175 3/4, 176, 176 1/4, 176 1/2, 176 3/4, 177, 177 1/4, 177 1/2, 177 3/4, 178, 178 1/4, 178 1/2, 178 3/4, 179, 179 1/4, 179 1/2, 179 3/4, 180, 180 1/4, 180 1/2, 180 3/4, 181, 181 1/4, 181 1/2, 181 3/4, 182, 182 1/4, 182 1/2, 182 3/4, 183, 183 1/4, 183 1/2, 183 3/4, 184, 184 1/4, 184 1/2, 184 3/4, 185, 185 1/4, 185 1/2, 185 3/4, 186, 186 1/4, 186 1/2, 186 3/4, 187, 187 1/4, 187 1/2, 187 3/4, 188, 188 1/4, 188 1/2, 188 3/4, 189, 189 1/4, 189 1/2, 189 3/4, 190, 190 1/4, 190 1/2, 190 3/4, 191, 191 1/4, 191 1/2, 191 3/4, 192, 192 1/4, 192 1/2, 192 3/4, 193, 193 1/4, 193 1/2, 193 3/4, 194, 194 1/4, 194 1/2, 194 3/4, 195, 195 1/4, 195 1/2, 195 3/4, 196, 196 1/4, 196 1/2, 196 3/4, 197, 197 1/4, 197 1/2, 197 3/4, 198, 198 1/4, 198 1/2, 198 3/4, 199, 199 1/4, 199 1/2, 199 3/4, 200, 200 1/4, 200 1/2, 200 3/4, 201, 201 1/4, 201 1/2, 201 3/4, 202, 202 1/4, 202 1/2, 202 3/4, 203, 203 1/4, 203 1/2, 203 3/4, 204, 204 1/4, 204 1/2, 204 3/4, 205, 205 1/4, 205 1/2, 205 3/4, 206, 206 1/4, 206 1/2, 206 3/4, 207, 207 1/4, 207 1/2, 207 3/4, 208, 208 1/4, 208 1/2, 208 3/4, 209, 209 1/4, 209 1/2, 209 3/4, 210, 210 1/4, 210 1/2, 210 3/4, 211, 211 1/4, 211 1/2, 211 3/4, 212, 212 1/4, 212 1/2, 212 3/4, 213, 213 1/4, 213 1/2, 213 3/4, 214, 214 1/4, 214 1/2, 214 3/4, 215, 215 1/4, 215 1/2, 215 3/4, 216, 216 1/4, 216 1/2, 216 3/4, 217, 217 1/4, 217 1/2, 217 3/4, 218, 218 1/4, 218 1/2, 218 3/4, 219, 219 1/4, 219 1/2, 219 3/4, 220, 220 1/4, 220 1/2, 220 3/4, 221, 221 1/4, 221 1/2, 221 3/4, 222, 222 1/4, 222 1/2, 222 3/4, 223, 223 1/4, 223 1/2, 223 3/4, 224, 224 1/4, 224 1/2, 224 3/4, 225, 225 1/4, 225 1/2, 225 3/4, 226, 226 1/4, 226 1/2, 226 3/4, 227, 227 1/4, 227 1/2, 227 3/4, 228, 228 1/4, 228 1/2, 228 3/4, 229, 229 1/4, 229 1/2, 229 3/4, 230, 230 1/4, 230 1/2, 230 3/4, 231, 231 1/4, 231 1/2, 231 3/4, 232, 232 1/4, 232 1/2, 232 3/4, 233, 233 1/4, 233 1/2, 233 3/4, 234, 234 1/4, 234 1/2, 234 3/4, 235, 235 1/4, 235 1/2, 235 3/4, 236, 236 1/4, 236 1/2, 236 3/4, 237, 237 1/4, 237 1/2, 237 3/4, 238, 238 1/4, 238 1/2, 238 3/4, 239, 239 1/4, 239 1/2, 239 3/4, 240, 240 1/4, 240 1/2, 240 3/4, 241, 241 1/4, 241 1/2, 241 3/4, 242, 242 1/4, 242 1/2, 242 3/4, 243, 243 1/4, 243 1/2, 243 3/4, 244, 244 1/4, 244 1/2, 244 3/4, 245, 245 1/4, 245 1/2, 245 3/4, 246, 246 1/4, 246 1/2, 246 3/4, 247, 247 1/4, 247 1/2, 247 3/4, 248, 248



J. R. TORREY & CO.,
Manufacturers of Razor Strops & Dressing Cases,
Sole Agents for Worcester Cutlery Co.
Importers of Fine Razor Hones.

New York Office: 97 CHAMBERS STREET.

UNDERHILL, CLINCH & CO.,

94 Chambers Street, New York,

DEPOT FOR

Geo. Selson & Co.'s Hatchets, Hammers, &c.

American Screw Co.'s Wood and Machine Screws,
Stove and Tire Bolts, Rivets, &c.
Brake's Brick Trowels.
A. Field & Son's Tacks, Brads, Nails, &c.
G. Ames & Son's Shovels, Spades and Scoops.

E. W. Gilmore & Co.'s Strap and T Hinges.
W. & S. Butcher's Edge Tools.
Nicholson File Co.'s Files.
Russell Jennings' Auger Bits.

GENERAL HARDWARE.

FISHING TACKLE.

IMPORTERS, MANUFACTURERS AND DEALERS IN

Fish Hooks, Rods, Reels, Silk and Linen Fish
Lines, Artificial Flies, &c., &c.

MANUFACTURERS' AGENTS FOR

SKINNER'S CELEBRATED SPOON BAITS,

Patent Adjustable Float and Sinkers "Wheeler's" Split Bamboo Fishing
Rods, "Nason's" Patent Portable Net Rings and Staffs,
"Allen's" "Hand Laid" Fishing Lines, "Globe"
Braided Silk, Linen and Cotton Lines.
"Mann's" Trolling Spoon Baits.

Dame, Stoddard & Kendall,

Successors to BRADFORD & ANTHONY,

374 Washington St., BOSTON, MASS.

**SEYMOUR'S
SHEARS, SCISSORS & SHEEP SHEARS**

OF SUPERIOR QUALITY, FINELY TEMPERED DIAMOND EDGES.

All Goods, both Nickel and Maroon Japanned Handles, are now made with Nickel-Plated Blades, giving them
an unequalled finish, for which there is no extra charge.

Every Pair Warranted. Money Refunded if Imperfect.

All SEYMOUR GOODS have well-hardened Blades, well coated with Nickel, and not, like many, with thin
Nickel wash and soft Blades.

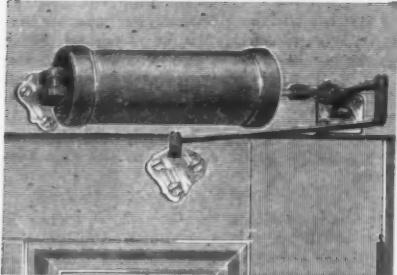


HENRY SEYMOUR CUTLERY CO.,

84 and 86 Chambers St., N. Y. City.

THE SHAW DOOR CHECK AND SPRING.

GREAT REDUCTION IN PRICE.



The SHAW DOOR CHECK AND SPRING CO.
have removed to their new factory, and with their
increased facilities for manufacturing their goods
have decided to reduce the price of each
Spring \$1.00 from former list, and thereby
bring the machine within the reach of all.

The SHAW CO. are the owners of the oldest
patented device for closing doors noiselessly, and
with their new improvement produce the only
check and spring which the trade can sell as gen-
eral hardware. The same spring can be applied to
either hinge or jamb side of both right or left
hand doors.

SHAW DOOR CHECK AND SPRING CO.,

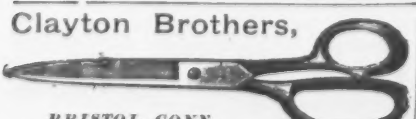
MANUFACTURERS AND SOLE AGENTS,

OFFICE AND FACTORY: 164 High Street, Boston, Mass. Branch Offices: 77 Rende St., New York.
154 Lake St., Chicago, Ill.

THE NORFOLK SHEAR CO.,
NORFOLK, CONN.,

Manufacturers of the finest line of Steel-
laid Shears, Scissors, Bent Trimmers, Bank-
ers' Shears, Button-hole Scissors and Dental
Snips. Send for Illustrated Catalogue and
Prices.

S. A. HAINES & CO., 90 Chambers Street, New York, General Agents.



Clayton Brothers,
BRISTOL, CONN.,
Manufacturers of Cast Shears,
Screw Drivers, Kitchen Knives, Roller Skates, &c.
The Best and Cheapest in the Market. Send for Prices.

SCREW DRIVERS
OF ALL KINDS
A SPECIALTY.

Send for Catalogue and Full List.
THE ELLRICH HARDWARE MANUFACTURING CO.,
HARDWARE SPECIALTIES,
Plantville, Conn.

CORPORATE MARK,



JOSEPH RODGERS & SONS'

(LIMITED)

CELEBRATED CUTLERY,

No. 82 Chambers Street, New York.

F. & W. CLATWORTHY, AGENTS.

The demand for JOSEPH RODGERS & SONS' pro-
ductions having considerably increased, they have, in
order to meet it, greatly extended their Manufacturing
Premises and Steam-power.

To distinguish articles of JOSEPH RODGERS &
SONS' manufacture, please to see that they bear their
Corporate Mark.

HEINZ & MUNSCHAUER,
MANUFACTURERS OF

Brass & Japan Bird Cages,

Refrigerators, Water Coolers, Chil-
dren's Sleighs, &c., &c.

Cor. Superior and Randall Sts.

BUFFALO, N. Y.

"YOU ARE OFF"

If you buy any EMERY CLOTH, EMERY PAPER, SAND
PAPER or GARNET PAPER until you have sent to us and
received our quotations. It is the talk of the whole Trade
the way we are slaughtering prices. Buy while we are in
the mood of selling way below every one else.

REMEMBER THAT WORLD-RENOVED SAND PAPER
POOL DOES NOT CONTROL US.

MONTGOMERY & CO.,

Geo. W. MONTGOMERY
Geo. W. CHURCH.

105 Fulton St., N. Y.



PATENT COMBINATION WRENCH.

Case-Hardened Throughout. Paris Interchangeable.

This Wrench not only combines the superior qualities of a Gas Pipe Wrench but also
all the requisite combinations of a regular Nut Wrench, thus making a combination
which has no equal.



No. 3 PATENT PIPE WRENCH.

The serrated jaws of the Wrench are interchangeable; that is, the same serrated plate
may be used for either the stationary or sliding jaw, so that if one plate is broken another
can be furnished adapted to either jaw without express designation. The slides, nuts and
various parts are also interchangeable, thus easily repairing the Wrench at very small
expense, and with as perfect practicability for further use as when the Wrench was new.

For Circulars and Price List, address

BEMIS & CALL HARDWARE & TOOL COMPANY, Springfield, Mass.

RICHARD DUDGEON,

No. 24 Columbia Street, New York.

Maker and Patentee of the Improved

Hydraulic Jacks

AND

Punches.



Roller Tube Expanders and Direct-Acting Steam Hammers.

Communications by letter will receive prompt attention.
Jacks for pressing on Car Wheels or Crank Pins made to order.



W. R. OSTRANDER & CO.,

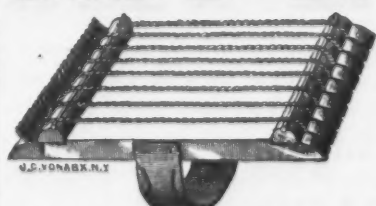
51 & 53 ANN STREET, NEW YORK.

Manufacturers of
SPEAKING TUBES, WHISTLES, ELBOWS, ORAL ANNUN-
CIATORS, BELL & ELECTRIC WIRE TUBING.

Complete outfits of Speaking Tubes, Whistles,
Pneumatic Bells, &c. A full line of Speaking
Tube Hardware constantly on hand. Catalogue
on application. Factory, DeKalb Ave., near Knick-
erbocker, Brooklyn, L. I.

JAY-EYE-SEE

New Improved Patent Wire
CURRY COMB.



Lightest and best for general use. Most durable
Comb made. Most humane and only Comb fit to use on
a horse's legs shoulders and flanks. It lifts every hair
and throws out the dirt. Rubs and cleans the skin, but
cannot cut or scratch it. Is without a rival for cleaning
a muddy or sweaty animal. A wonder on a shedding
horse. It cleans itself, and has an improved attachment
which cleans a brush with ease and rapidly. Send for
Circulars and Prices. Sample by mail, 30 cents.

MUNCIE NOVELTY CO., MUNCIE, IND.

Mattby, Curtis & Co., New York, Sole Agents.

SMALL GRAY

IRON

CASTINGS.

HAIGHT & CLARK,

Iron Founders, Albany, N. Y.,

MANUFACTURERS OF

ORNAMENTAL AND ART CASTINGS, ROSETTES AND PICKETS FOR WIRE WORKERS,
Bases and Boots for Wire Forms, Piano and Organ Castings, Machinery Cast-
ings, Stove Patterns taken from the Wood. Correspondence invited for all
kinds of Castings. Japanning, Nickel-Plating, Bronzing, in all their Branches.
Send for Wire Workers' Catalogue.

Established 1836.

Alfred Field & Co.,

93 Chambers and 75 Reade Streets,

NEW YORK

IMPORTERS OF

HARDWARE, CUTLERY, GUNS.

SOLE AGENTS FOR

Joseph Elliot & Son's Razors.
Elev Bros.' Caps, Wads, &c.
Isaac Greaves' Sheep & Garden Shears.

HEADQUARTERS FOR

Wostenholm's Pocket Cutlery & Razors.

W. & S. Butcher's Razors.

John Wilson's Butcher Knives, &c.

ANVILS. CHAIN. FILES.

GEO. H. CREED,

SHIP CHANDLERY,

103 Reade Street, New York,

Manufacturer of and wholesale dealer in Cotton
and "Long Flax" Sail Duck, Cotton and
Linen Tapes, Creed's Patent Ship's Crews, Hel-
man's Wire Rope Splicers. Agent for Raymond's
American Crane Oil, for lubricating Cylinders and
Valves.

A. G. COES
PAT. DEC. 26, 1871.

Established in 1839.

A. G. COES & CO.,

WORCESTER,

MASS.,

Successors to

L. & A. G. COES,

Manufacturers of

THE GENUINE

COES

Screw

Wrenches.

PATENTED

May 2, 1871.

December 26, 1871.

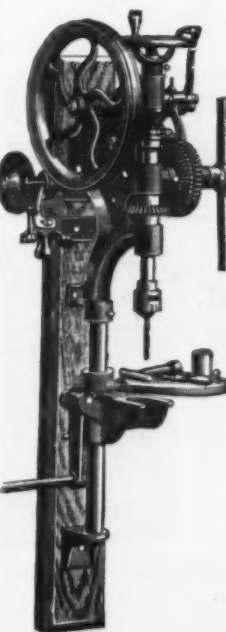
December 23, 1875.

August 1, 1876.

The back strain when the Wrench is used is borne
by the bar, not by the handle.
The strongest Wrench made, and the only success-
ful Re-enforced Bar.
None genuine unless stamped

A. G. COES & CO.

Our Agents, JOHN H. GRAHAM & CO., 113 Chambers
St., New York, carry a full line of our goods and will
be pleased to serve you at factory prices.



GEO. BURNHAM & CO., Worcester, Mass.,
Manufacturers of
BLACKSMITHS' UPRIGHT SELF-FEEDING DRILLS,
HAND OR POWER.
Patented March 20, 1883, Oct. 23, 1883 and June 16, 1885.
Superior Design. Improved Workmanship. Latest Improvements.
Send for Illustrated Price List.

LAWN MOWER.
The New Model

Our Latest & Best
MOWER.

Send for Circular & Price List.



CHADBORN & COLDWELL MANUFACTURING CO.
NEWBURGH, N. Y.



BEVIN BROS. MFG. CO., Easthampton, Conn.,
Manufacturers of
Sleigh Bells, House, Tea, Hand, Gong Bells, &c.

THE BARTON BELL CO.,

East Hampton, Conn.,

Manufacturers of

Sleigh, Hand, House, Tea and Call Bells

In great variety.

Illustrated catalogue on application.

JOHN H. GRAHAM & CO., Agents,

113 Chambers St., N. Y.

Where a Complete Stock is Maintained.

NORTH BROTHERS,

Iron Founders,

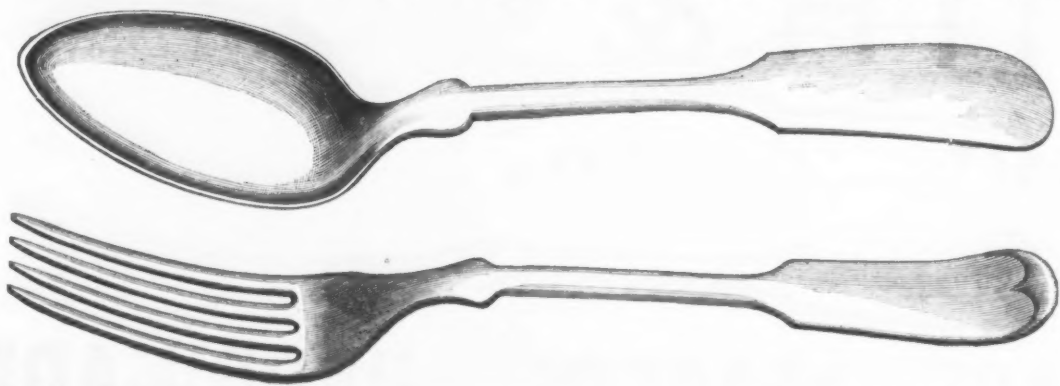
Light Castings a Specialty.

N. W. Cor. 23d and Race Streets,
PHILADELPHIA.

Correspondence solicited.

HALL & ELTON'S GERMAN SILVER

1837.



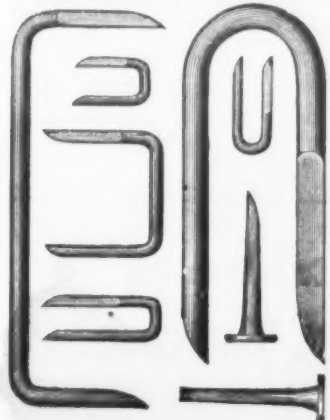
1886.

In addition to Spoons of this well-known brand, we are now prepared to furnish Forks of the same quality. We GUARANTEE these goods to be SOLID and of UNIFORM quality throughout, with no coatings to wear through or flake off, and with no liability to RUST.

HALL, ELTON & CO.,

Wallingford, Conn., and 47 E. 13th Street, New York.

FLORENCE TACK CO.,

P. O. BOX 39, FLORENCE, MASS.,
Manufacturers of every variety of

TACKS, SMALL NAILS, DOUBLE-POINTED TACKS AND STAPLES.

Our STEEL CLINCH STAPLES will drive in harder wood or mortar than when made from iron. They are also clinched as well as any soft iron staples.

AGENTS IN ALL FOREIGN COUNTRIES.

119 South Fourth Street,
PHILADELPHIA.Branch Office, 605 Seventh St., Washington, D. C.
H. HOWSON, Engineer and Solicitor of Patents.
O. HOWSON, Attorney at Law and Counsel in Patent Cases.
SEND FOR CIRCULARS.

The best and only complete arrangement for WINDOW AND DOOR SCREENS ever invented. No mousing or tearing, cannot sag or warp, and any one can make them. CORNERS finished in Bronze or Nickel Plate. Sticks in the White or stained in imitation of Black Walnut.

SEND FOR PRICE LIST.

PORTER MFG. CO., BURLINGTON, VT.

W. H. McMILLAN,

113 South St. (Up-Stairs), bet. Peck Slip and Beekman St., New York.

Block and Pump Manufacturer.

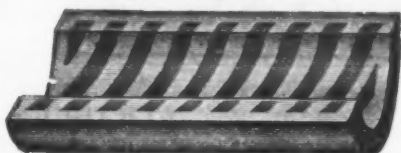
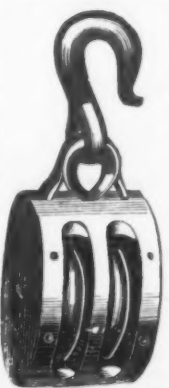
Manufacturer of Inside Iron Strap and all kinds Tackle Blocks, Mast Hoops, Hanks, Belaying Pins, Hand Spikes, Hand Pumps, &c. Also Dealer in Lignumvitae Wood, for Beam Faces and Roller Beds, &c.

Telephone Calls: Office, "Nassau 142." Factory, "Williamsburg 377."

Factory: 33 to 40 Penn St., Brooklyn, E. D.

Sole Agent for John Smalley's Graphite Bushings.

NO OIL REQUIRED.



Agent for Wilson Mfg. Co.'s Pat. Sheaves and Roller Bushings.

SHUBERT & COTTINGHAM,

MANUFACTURERS OF ALL KINDS

TACKLE BLOCKS.

Lignum-Vitæ and Iron Sheaves.

WITH

Plain, Roller and Self-Lubricating Bushings.

Heavy Purchase Blocks

FOR

Contractors, Builders, Railroad and Mining Use.

118 North Delaware Avenue,

Factory, Beach and Norris Streets.

PHILADELPHIA,

P. A.

SEND FOR CATALOGUE.

BAGNALL & LOUD BLOCK CO.,

BOSTON MASS.,

MANUFACTURERS OF THE

CELEBRATED STAR BRAND OF TACKLE BLOCKS.



These goods can be obtained of the general hardware trade and of our

AGENTS

F. BALDWIN, 33 South St., New York.

J. F. LOVEJOY, 102 Chambers St., New York.

C. H. GURNEY & CO., 247 Lake St., Chicago.

BRODERICK & BARCOM ROPE CO., St. Louis.

BAUMGARDNER, WOODWARD & CO., Philadelphia, Pa.

UHLER & ENGLISH, Philadelphia, Pa.

"STANDARD"

Easy SPRING

MORTISE
KNOB
LOCKS.Three Steel Tumblers, Nickel-Plated
Steel Key, Heavy Bronze
Front and Bolts.

For Prices, see Large Catalogues.

THE YALE & TOWNE
MFG. CO.,

STAMFORD, CONN.

NEW YORK, 62 Reade Street.

BOSTON, 224 Franklin Street.

CHICAGO, 25 Washington Street.

PHILADELPHIA, 15 North 6th Street.

No. 1620.

your London contemporary, the *Ironmonger*, give the following details:

Summary by Districts.

District.	Built.	Wholly idle.	Temporarily idle.	In blast.
Cumberland.....	53	18	35	5
Derbyshire and Nottingham.....	54	16	38	3
Durham and Northumberland.....	48	28	20	3
Gloucester, Wilts, and Somerset.....	15	12	3	3
Lancashire.....	52	23	29	3
Lincolnshire.....	21	8	13	3
Northampton and Leicester.....	32	10	22	14
Shropshire.....	19	14	5	4
Staffordshire, North.....	40	18	22	19
Staffordshire, South.....	169	74	95	30
Yorks, Cleveland.....	109	21	88	76
Yorks, West Riding.....	40	17	23	14
Wales, North.....	10	5	5	4
Wales, South.....	136	73	63	31
Scotland.....	143	34	20	89
Totals.....	871	377	91	408

General Summary.

Total number of furnaces	871
Existing, June 1, 1886	408
In blast, June 1, 1886	408
Out of blast June 1, 1886	9
In course of erection, June 1, 1886	9
On ordinary pig iron of various districts.....	290
On hematite pigs (about).....	93
On spiegel-eisen.....	11
On basic.....	9

This shows a steady fall in the power of production, about 13 furnaces having been stopped in May. The number of furnaces on hematites, however, is slightly larger than it was a month ago. Since these returns were compiled five other furnaces have been stopped in Scotland.

MIDDLESBORO' FIG IRON

is quiet and in but moderate demand at the subjoined rates for G. M. B., f.o.b. at makers' wharves in the Tees, for net cash:

No. 1 Foundry.....	32/	Mottled.....	28/
" 2 ".....	31/	White.....	27/6
" 3 ".....	29/6	Refined metal.....	46/
" 4 ".....	29/	Kentledge.....	33/6
" 4 Forge.....	28/6	Cinder.....	30/

The official returns of the Cleveland Ironmasters' Association for the month of May show that the total make has been 211,049 tons, 22,340 tons more than for April; the stocks were 669,772 tons, and the shipments 70,797 tons.

THE HARDWARE TRADES.

In London, in spite of the pessimists and the unsettled weather, the run of exhibitions continues gaily enough. Last week in addition to the Colonial and Indian Exhibition we had the Sportman's at the Aquarium, Westminster, and in conjunction to the horse show another sportsman's exhibition at the Agricultural Hall, Islington. When so many complaints are rife as regards a paucity of business it becomes a matter of interesting inquiry how it is that so many persons have time and means to gratify to search after novelties and visit exhibitions in the manner they do. As a leading business man remarked the other day when conversing on the topic, "it is altogether unreasonable to assume that times are so very bad when people go about seeking entertainment in that fashion. The truth is, taking it all round, there is as little cause for grumbling as there ever was, but, of course, people must complain, and so we go blundering along." At Birmingham agricultural prospects have certainly not improved under the influence of the recent heavy rains, and the unseasonable weather, which had already practically killed the spring trade, is playing havoc with the demand for summer goods. The shipping trade is more satisfactory and the orders arriving from Canada and the Cape, as well as from Australia and New Zealand, are just now of considerable value. Although the cholera in Italy is a disturbing factor, the Mediterranean trade has been for some time past fairly good, and from Egypt in particular the indents have been valuable. At Sheffield the county orders have slackened visibly in lighter industries during the last week or so days. Manufacturers account for the check by the broken weather and the strong prospect of the best part of the summer being taken up by another electioneering campaign. Foreign and colonial indents remain without much change. Some of the local houses are making quiet preparations for resuming the place which they lost in the Spanish market when the French and German manufacturers obtained preferential arrangements, and should the present negotiations be carried through to a successful issue it is calculated that something will be recovered almost at once. American and Canadian orders are still arriving in good numbers. Principals representing several local houses in the steel and cutlery trades are now in the west beating up customers while the purchasing power lasts, and in some cases the journey has been justified by conspicuous successes. Colonial lines have in the last mails made a better show. In New South Wales the fears of further drought have been dispelled by the appearance of abundant rains, and practical proofs of the confidence thus restored have arrived with the news. Western Australia is now receiving special attention from houses with colonial interests.

TIN PLATES.

In London there has not been anything unusual this week in respect of the demand for America, but a pretty good business has been done in some quarters on Australian account. Prices are well maintained, and the generality of the works are reported to be fairly off for work. I quote G.O.B. IC cokes 13/3 @ 13/9, f.o.b. Liverpool. At Liverpool the tin plate business seems in a rather unsettled state just now, pending the decision of masters and men at certain works. Another topic which has engrossed attention is the reported large bear sales that have been made lately in America, and this has disturbed the course of business not a little, as the prices at which these sales have been made are below anything yet known here before. Therefore it is not surprising that business has been extremely quiet so far as regards the number of inquiries received and the orders placed. Buyers are not inclined to go in for long lines, as they seem to think prices may go lower yet, despite the fact that the stocks of surplus plates at certain depots are decreasing week by week, and that tin is advancing daily, and also that we are in the best quar-

ter of the year for the tin-plate trade. What little business there has been doing this week has been chiefly in coke tins, Bessemer steel cokes and Siemens steels with coke finish. Prices are practically unchanged, the bottom price for cokes being still 13/3 IC, and there are some Bessemer still to be had at this low figure; and Siemens, 14/ IC. The demand for charcoal tins and ternes is rather small as compared with the supply, especially of the latter. The difficulty with ternes is the multiplicity of new brands that are offering from all quarters. Ordinary kinds have been selling at 12/6 for a long time, and the tendency this week is toward lower prices than have ever yet been touched—12/3 and even 12/.

American versus English Bridge-Building.

Writing from Sydney, New South Wales, Mr. Walter Shellshear discusses as follows the reasons why American bridge-builders can successfully compete with their English rivals in the colonies:

In England it is the usual practice for engineers to prepare plans and specifications of bridgework, and invite tenders for the construction of the work in accordance with their plans. It too often happens that the designer has not fully considered his design from a manufacturer's point of view. A great variation in sections of T, L and C irons are in many cases introduced, rendering it difficult for the manufacturer to secure his material without going the round of the merchants. Again, difficult and often very unnecessary smithwork is introduced, and lastly, instead of a simple framed structure, complicated treble and quadruple systems of triangulation are introduced. There also does not appear to be a general understanding as to the quality of material, one engineer requiring one scale of tests and another a very different scale. Now all this must complicate the arrangements of a manufacturer without adding to the quality or suitability of the work.

In America it is usual for the railway companies to advertise for tenders on a very different system, and it is on this account that the American manufacturers have a very great advantage over the English, as will be seen when their system is considered. In inviting tenders for bridgework in America it is usual for the railway companies to furnish plans and sections of the site, with other local information, together with tables giving the standard loads which the proposed structure is to carry, the quality of material and tests to which it will be subjected, and also if the bridge is to be a deck or through bridge. With these particulars the bridge companies are asked to tender, the conditions being that they submit detail plans, together with strain sheets, with their tenders, and it rests with the railway companies' engineers to examine the plans and strain sheets to see if they are in accordance with the specified standards. The bridge companies are under the management of bridge engineers, with a trained staff, who make it their business to design work so as to afford the greatest facilities for manufacture; the pins and links and other details are drawn to suit their standard dies, and the sections of iron are those for which they have rolls, for, as most of the big bridge firms have a rolling mill attached, there is no difficulty in the way of collecting material when an order has been secured.

In England the engineer is paid a commission on the cost of the work, and there is therefore not the same inducement to study rigid economy as in America, where the bridge company has to study economy in order that he may secure the contract; at the same time the stipulations as to limits of stress in the structure enable the railway companies' engineers to decide whether the prescribed limits have been exceeded or not. An examination of the plans of American bridges will show that simple framed structures are the order of the day, and that the details are worked out in such a way that there is the greatest possible repetition, thus enabling the factory system to be carried out to the fullest extent. The modern American bridge is a substantial and economical structure, built on strictly scientific principles, possessing none of the erratic peculiarities of the earlier examples of American structures, being, in fact, equal to the best class of bridgework manufactured in England or on the Continent. The whole secret of the success of the American competition is this: In England there is an absence of system from first to last in this branch of manufacture; in America bridge-building has been reduced to a system worked out on sound scientific and commercial principles.

Mr. Charles Hallock, who is well known as an experienced traveler, and who has thoroughly studied Alaska and its resources, is about to issue an illustrated work, now on the presses of the Forest and Stream Publishing Co. It is entitled "Our New Alaska; or, the Seward Purchase Vindicated." The glowing accounts of the country from the pen of Mr. A. P. Swineford, who was so long identified with our most important iron-ore interests, have contributed toward awakening a special interest in the trade, and have served to pave the way for Mr. Hallock's work among what we hope will become a large constituency.

The manufacture of briquettes is extending in Silesia as elsewhere. New works of considerable magnitude have just been erected by the firm of Cassar Wollheim & Schwartzkopf, and at the König's Colliery, at Königshütte, to manufacture according to Balke's patent, wherein the residue of starch factories is used as the cementing material. This system is now in successful operation in several places in Germany.

A novel railroad bridge has recently been constructed at Harrison, on the Toronto, Gray and Bruce Railroad. The novelty lies in constructing the bridge of old iron rails, and is said to compare favorably in cost with wooden bridges.

It is proposed to pull down the old State House in New Haven, which is much dilapidated.

H. D. SMITH & CO.,

Plantville, Conn.,

MANUFACTURERS OF THE

BEST QUALITY CARRIAGE MAKERS' HARDWARE,

Manufacture the Largest Variety of Forged Carriage Irons, of Best Material and Workmanship.

PRICES LOW FOR QUALITY OF WORK FURNISHED

SEND FOR PRICE LIST.

BURGESS STEEL AND IRON WORKS,

PORTSMOUTH,
OHIO.

MANUFACTURERS OF CRUCIBLE AND OPEN-HEARTH STEEL, AND U. S. NORWAY IRON.

COMPRESSED IRON AND STEEL SHAFTING. IRON AND STEEL BOILER PLATE.

5-Ply Safe and Jail Steel. Iron and Soft Steel Center Plow Steel.

Spring, Tool and Tire Steel, and Steel for Agricultural Purposes, Cut to Patterns Sent Us.

A. FIELD & SONS, MANUFACTURERS OF WIRE NAILS

of Every Quality and Description.
Taunton, Mass., & 78 Chambers
Street, New York,

S. A. HAINES & CO., Iron, Steel, Nails and Hardware, 90 Chambers Street, New York.

Richmond Star Lawn Mower.

Lightest, Easiest Running and
Best Made.

For prices please write to:

DILLE & McGUIRE MFG. CO., Richmond, Ind.
S. A. HAINES & CO., New York.
H. O. STRATTON, Boston, Mass.
SHIELDS & BRO., Philadelphia, Pa.
WALSH, HOEN & VON KAPFF, Baltimore, Md.
HAWLEY BROS. HARDWARE CO., San Francisco, Cal.
W. T. BARBEE, Lafayette, Ind., and Chicago, Ill.
WELLS & NELLAGAR CO., Chicago, Ill.
WHITMAN & BARNES MFG. CO., Cincinnati and Chicago.
HOWELL, GANO & CO., Cincinnati, Ohio.
WITTE HARDWARE CO., St. Louis, Mo.
SHAPLEIGH & CANTWELL HARDWARE CO.,
St. Louis, Mo.
ST. LOUIS HARDWARE CO., St. Louis, Mo.
D. AUSTIN & CO., Kansas City, Mo.
D. H. SMITH HARDWARE CO., Sedalia, Mo.
KILBOURN, JONES & CO., Columbus, Ohio.
DAVIS & HUNT, Cleveland, Ohio.



T. B. RAYL & CO., Detroit, Mich.
GUNN HARDWARE CO., Grand Rapids, Mich.
HILDEBRAND & FUGATE, Indianapolis, Ind.
JAMES WOODWELL & CO., Pittsburgh, Pa.
MILLER BROS. & FLETCHER, Minneapolis, Minn.
MORRISON & CO., Atlanta, Ga.
C. M. McCLUNG & CO., Knoxville, Tenn.

"STEAM" A valuable book for every
Steam user and Engineer,
published for FREE DISTRIBUTION by
THE BABCOCK & WILCOX CO.,
Manufacturers of
WATER-TUBE BOILERS,
107 Hope St., GLASGOW. 30 Cortlandt St., NEW YORK.

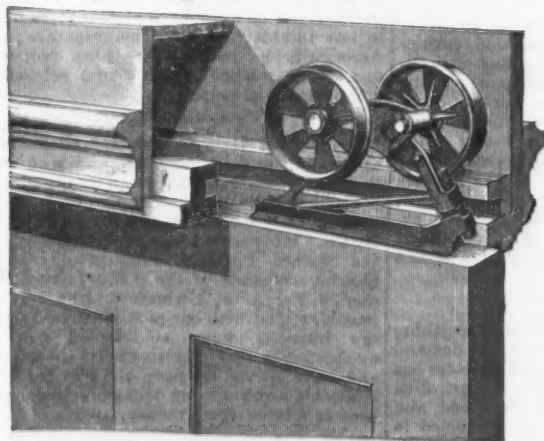
SOMETHING NEW! The Diamond Lock Faucet,

John Sommer's Son,
Manufacture of John Sommer's Wooden Faucets
Mallets and Variety Wood Turning.
8, 10 and 12 Pearl St. Newark, N. J.



1st. A Lock Faucet that cannot be
picked, will not leak, and keeps
tight.
2d. A Faucet that can be driven
and will not split, as it has a solid
head, its working parts being on
the top.
3d. Made from selected hard rock maple polished, all metal parts
used in its construction being pure black tin, which, as commonly
known, will not corrode, or affect any kind of liquid.

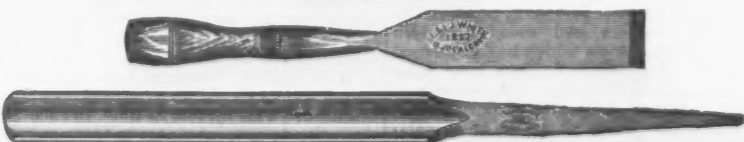
Barry's Patent Parlor Door Hanger.



The only Hanger made that
will not bind on an
uneven track.

Send for Circular and Prices
to
SYRACUSE BOLT CO.,
Syracuse, N. Y.,
OR
HENRY B. NEWHALL CO.,
105 CHAMBERS STREET,
New York Agents

ESTABLISHED 1837.



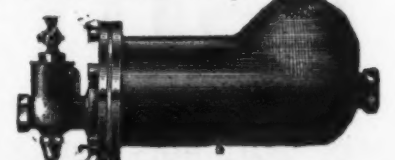
L. & I. J. WHITE,
MANUFACTURERS OF

EDGE TOOLS & MACHINE KNIVES
Coopers', Carpenters' and Ship Tools, Cleavers, &c.
FULL LINE CHISELS.

310, 312 & 314 EXCHANGE ST.,

BUFFALO, N. Y.

The Curtis Steam Trap.



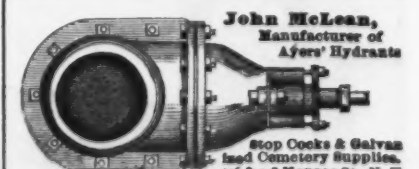
Has automatic air discharge; has a differential open-
ing, thus discharging all the water as fast as it comes.
Is very accessible for cleaning, the valve being on the
outside. Send for circular. Manufactured by the
CURTIS REGULATOR CO.,
61 Beverly St., BOSTON, MASS.
GENERAL AGENTS: 109 Liberty St., New York
601 N. 4th St., Philadelphia, Pa.; 14 South Canal St.
Chicago, Ill. 707 Market St., St. Louis.



COBB & DREW, PLYMOUTH, MASS.,

Manufacturers of Copper, Brass and Iron Rivets;
Common and Swedes Iron Leathered, Carpet, Lace
and Gimp Tacks; Finishing, Hungarian, Trunk,
Clout and Cigar Box Nails, &c. Rivets made to
order.

NEW YORK AGENTS,
**GRUNDY & DISOSWAY,
HARDWARE,**
165 GREENWICH STREET.
Agents for the Philadelphia Star Carriage and Tire Bots



SOLID SPOUT MINERS' LAMP.



WOLF'S Benzine Safety Lamp

FOR
MINES, FACTORIES, WAREHOUSES, SHIPS, &c.
OFFICIALLY PRONOUNCED SUPERIOR TO ALL OTHERS.
1. Absolutely SAFE.
2. Burning costs about ONE-HALF, lighting power
nearly DOUBLE, that of oil lamps.
3. Cannot be opened by the miner.
4. Can be lighted in mines without DANGER.
SOLE AGENT, **E. J. SCHMITZ,**
202 East 20th Street, New York.

ESTABLISHED 1855

A. WICKOFF & SON

PATENT

WOOD-WATER-PIPE

CHAIN-PUMP-TUBING

101 to 111 EAST-CHEMUNG-PLACE

EUMIRA-NY

N. Y. MALLET & HANDLE WORKS,

Manufacturers of
CALKERS', CARPENTERS, STONE CUTTERS', TIN,
COPPER AND BOILER MAKERS'



MALLETS,

Hawking Beets, Hawking
and Calking Irons; also all
kinds of Handles, Sledge,
Chisel and Hammer Handles.

ALSO

Cotton & Bale Hooks.
Patented Feb. 13, 1877, a new
combination of Hooks.

456 E. Houston St., N. Y. City

E. PHILLIPS & SONS,

MANUFACTURERS,
South Hanover, Mass.

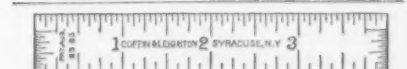
TACKS.

F. R. EMMONS & BRO.

21 WARREN STREET,
New York.

**D. W. Gallaudet
& Co.,**

Cor. Broadway and Wall St., New York.
Bankers and dealers in COMMERCIAL PAPER.
Stocks and Bonds dealt in for cash or on margin at
New York Stock Exchange.



MACHINISTS' SCALES.

PATENT END GRADUATION.

Liberal Discount to the Trade. Send for List.

COFFIN & LEIGHTON, Syracuse, N. Y.

THE BOLTON STEEL CO.,

CANTON, OHIO,
MANUFACTURERS OF BEST REFINED

TOOL STEEL

And Other Fine Grades of

CAST STEEL.

FROST'S PAT. THILL SPRING.



very Pair Warranted
or One Year and
No Rattle.

Send for Circular to

STILES FROST,

276 Devonshire St., Boston, Mass.

PATENTS.

PROMPT WORK.
MODERATE FEES.
U. S. and Foreign Patents
procured. Trade Marks
and Labels registered. 15 years' experience: 4
years Examiner in U. S. Patent Office. Patent
causes litigated. Expert searches and opinions
as to scope, validity and infringement of patents. Send
model or sketch of your invention for free opinion
whether patent can be secured, and new book on pa-
tents, citing recent court decisions. Mention this pa-
per. E. E. STOCKING, Att'y, opp. Patent Office,
Washington, D. C.

KEYSTONE SCREW CO.,

17th and VENANGO STS., PHILA.

J. BILLERBECK,

Manufacture of
IRON AND BRASS
Gimlet-Pointed Wood Screws.
WRITE FOR DISCOUNT.

NEW YORK BELTING & PACKING CO.

WAREHOUSE: 15 PARK ROW, NEW YORK.

THE OLDEST AND LARGEST MANUFACTURERS IN THE UNITED STATES OF

**VULCANIZED RUBBER IN EVERY FORM ADAPTED
TO MECHANICAL PURPOSES**

MACHINE BELTING

WITH SMOOTH METALLIC RUBBER SURFACE.

THIS COMPANY HAS MANUFACTURED THE LARGEST
BELTS MADE IN THE WORLD FOR THE PRINCIPAL
ELEVATORS AT CHICAGO, BUFFALO AND
NEW YORK.

STEAM AND WATER HOSE.

RUBBER TEST HOSE.
ANTISEPTIC FOR THE USE OF STEAM AND HAND FIRE
ENGINES, FORCE PUMPS, MILLS, FACTORIES, STEAM-
ERS AND BREWERS.

**CAR SPRINGS OF A SUPERIOR
QUALITY**

Original Solid Vulcanite Emery Wheels.

PATENT ELASTIC RUBBER BACK SQUARE PACKING.

BEST IN THE WORLD.

FOR PACKING THE PISTON RODS AND VALVE STEMS OF STEAM ENGINES AND PUMPS.

**CORRUGATED
RUBBER MATS AND MATTING.**

FOR HALLS, FLOORING, STAIRS, TRIN, STAIRWAYS, ETC.

JOHN H. CHEEVER, TREASURER.

The Cameron STEAM PUMP

IS THE

Standard of Excellence

AT HOME AND ABROAD.

THE

A. S. CAMERON

Steam Pump Works,
Foot of East 23d St., New York.

H. A. ROGERS, 19 John St., N. Y.

RAILWAY

AND MACHINISTS' SUPPLIES.

EVERY REQUISITE IN THE LINE.

TANITE EMERY WHEELS.

SOLE U. S. AGENT FOR MONCRIEF'S SCOTCH GAUGE GLASSES.



BUCK BROTHERS, MILLBURY, MASS.

The Most Complete Assortment in the U. S. of

Shank, Socket Firmer and Socket Framing Chisels.

PLANE IRONS.

CAUTION.—Buyers should be on their guard and not have inferior goods passed on them by unprincipled
persons who represent them as our make. Our tools are stamped "BUCK BROTHERS," and our labels have
on our trade-mark also, "Riverlin Works."

VARIETY IRON WORKS. ALFRED C. REX & CO.,

MANUFACTURERS OF

Hardware Specialties

AND

**Novelties in Iron, Brass
and Bronze.**

Special attention paid to Electro-
plating in all its branches.

MAIN OFFICE AND FACTORY,
FRANKFORD, PHILADELPHIA.

BRANCH OFFICES:

PHILADELPHIA, 413 Commerce St.
NEW YORK, 104 Chambers St.
CHICAGO, 89 Lake St.
SAN FRANCISCO, 109 California St.

—BORTHWICK'S—
PATENT ROTARY SAW SET.



EXAMINE THE PRINCIPLE as illustrated in cut. NOTICE ROTARY ACTION by which a perfect set is
assured without danger of breaking teeth. For Price List and Terms address

BORTHWICK SAW SET CO., 337 Market St., Philadelphia, Pa.

CHARLES BURGESS,

MANUFACTURER OF HAMMERED

SPECIAL CRUCIBLE STEELS

FOR ALL PURPOSES.

We make a specialty of Self-Tempering Steel for Lathe, Planer and other Tools, and war-
ranted equal to any imported article in the market. No common grades made. When ordering,
state purpose for which steel is wanted.

TITUSVILLE, PA.

The Record of the Spring Lake Charcoal Furnace.

In his forthcoming report on the mines
and mineral interests of Michigan Mr. C. D.
Lawton, commissioner, gives the following
data on the record of the Spring Lake Fur-
nace:

This furnace, at Fruitport, in Muskegon
County, on the east shore of Lake Michigan,
has been from the time it first went into
blast extremely successful. It probably has
the best record of any furnace in Michigan,
and I do not think that the record of this
furnace for the past year can be equaled by
any other furnace of its size in the country.
If the record was ever equaled in a charcoal
furnace the fact has not come to my knowl-
edge. It will be seen that the ore used did
not give an extra yield in the furnace, it
having been largely soft hematite—Milwau-
kee mine and Lake Superior mine ores.
The wood used for coaling was not what
would be termed extra, but was certainly
good—30 per cent. hemlock and 70 per cent.
mixed elm, beech and sugar-maple. The
stack is 46 feet high, and the diameter of
the bosh is 10 feet 8 inches—not by any
means a large furnace. The limestone for
fluxing was from Kelly Island. Statement
of the working of the Fruitport Furnace for
year ended December 31, 1885:

Days run.....	321
Bushels of charcoal used.....	1,444,675
Tons of ore used.....	28,684.8
Tons of limestone used for flux.....	386.5
Furnace charges run.....	57,787
Tons of pig iron made.....	17,217
Bushels of charcoal per ton of iron.....	84
Pounds of limestone per ton of iron.....	50
Pounds of ore smelted per ton of iron made.....	3,782
Average number of gross tons of pig iron made per day.....	53.6
Per cent. of yield of ore.....	69.4
Per cent. of soft hematite ore used.....	20
Per cent. of hard specular ore used.....	80
Size of steam cylinders.....	30 in. diam., 4-ft. stroke.
Size of wind cylinders.....	60 in. diam., 4-ft. stroke.
Average number of revolutions per minute.....	37
Average pressure of blast.....	3 3/4 lbs.

There are two ovens, one on the Player
plan, having 24 upright pipes, each 12 feet
high, giving from 850° to 900° temperature
of blast. The other oven is small, old style
of horseshoe or U pipes, 3 1/2 inches by 6 1/2
inches diameter, and 8 feet high. These
give a temperature the same as the other.
The average hot-blast temperature is 875°.
The charcoal is measured, 27 1/2 cubic inches
making a bushel. When made from dry
wood a bushel weighs 20 pounds as an
average. The furnace is advantageously
situated on Spring Lake, so that the ore
vessels unload expeditiously in the stock-
house of the furnace. The freight of the
ore from Escanaba, put in the stock-
house, is but 75 cents a ton; Kelly Island
limestone costs, laid down at the furnace,
\$1.25 a ton. Freight to Chicago on the
iron is 75 cents a ton; the same to
Cleveland. The company have 45 coal-kilns—
20 rectangular, and 25 round ones. The
former hold 80 or 90 cords of wood, and the
latter 60 cords. The wood costs from \$1.25
to \$1.75 a cord. Wages paid, \$1.25, \$1.40,
\$1.50 and \$2 a day.

The ore used in 1885 was one-quarter Lake
Superior mine No. 1 specular, one-half Lake
Superior mine hematite, and one-quarter
Milwaukee mine ore. The ores bought for
1886 are Coly, Lake Angeline and Cleve-
land No. 1 hard ore. From January 1,
1885, to July 1, 141 days, the furnace made
55 tons of iron a day average, using an
average of 80 1/2 bushels of charcoal per
ton. For the week ended April 4, 1885,
seven days, the total product was 441 tons,
using an average of 68 1/2 bushels of char-
coal per ton, the ore yielding 60 1/2 per cent.
in iron. The product runs up to 68 and
even 73 tons of iron a day. These statis-
tics I have taken from the books of the
company myself, the books having been
submitted to my inspection. Mr. J. C. Ford,
the manager, and Robert Lomeraux, the
foundryman, are, it need not be said, skilled
in their work.

A New Iron Enterprise in South Russia.

Engineering reports that a company has
been formed, with a capital of £2,000,000,
to work the iron deposits of the Krivoy Rog
district, which some years since were in-
vestigated by a number of Philadelphia capi-
talists. Situated in the Ekaterinoslav Gov-
ernment, they first became thoroughly
known after a systematic survey conducted
by the Russian authorities a few years ago.
The Ekaterinen Railway was then con-
structed by the Government to connect the
deposits with the coal fields of the Donetz
Valley, and since the completion of the line
in 1883 upward of 3000 tons of ore have
been sent regularly every month to the
works of Hughesovka alone, the price, in-
cluding placing on the railway truck, being
2 1/2 copecks a good, or 2/8 per ton. Last
year a fresh outlet was opened in Poland,
a quantity being sent from Krivoy Rog to sev-
eral of the iron and steel works in the
Vistula region. Yielding 63 per cent. of
splendid metal, the ore gave such satisfac-
tion that an international company, favored
by the Russian Government, was formed to
develop the mines on a large scale. The
capital subscribed was 19,500,000 rubles,
of which the Warsaw Steel Works have fur-
nished 2,500,000 rubles; Lilpop & Rau,
1,500,000 rubles, and the remaining 15,-
500,000 rubles have been made up by for-
eign capitalists, including Cockerill &
Co., the Grande Société Franco-Italienne
des Houilles et Foches & Paris, the
Reinische Stahlwerke, of Ruhort; the
banker Surmont, of Aix-la-Chapelle, and
Messrs. Ransome & Co., of London. As an
encouragement the Russian Government
have agreed to give the company an order
for 70,000 tons of rails, 30,000 tons of rail-
way material, &c., amounting in value to
over £1,000,000, of which a considerable
amount will be paid by the Government in
advance. A clause in the agreement also
provides for a bounty on steel rails manu-
factured on the spot. For some time past
agents of the syndicate have been complet-
ing the arrangements at Ekaterinoslav for
starting the concern, and it is believed that
it will be placed on a good working footing
by the winter. Another scheme, favored
by Krupp, for establishing a gun foundry

for the Russian Government in the Krivoy
Rog district has also been discussed during
the spring, but the terms asked by the Ger-
man syndicate were no favorable enough
to please the Minister of War. The project,
however, has not yet entirely fallen through,
and, even should no foreign capitalists em-
bark upon the enterprise, it is believed that
the Ministry of War itself will establish an
arsenal there for supplying weapons for the
use of the Black Sea fleet. At present the
guns mounted on the coast batteries and
men-of-war of the Euxine are manufactured
in the Ural Mountains or at St. Petersburg,
and the cost of the conveyance over many
hundred miles of railway is very heavy.
The saving effected by establishing an arsenal
in the Krivoy Rog district would thus
justify a considerable subsidy.

Foreign Markets.

FRANCE.

PARIS, June 10, 1886.—*Metals*—There has been a
better feeling and more doing. Copper is slightly
cheaper. Tin better, and Lead and Spelter show
no change. We quote at the close: Copper.—Chill
Bars, 105 francs @ 100 kg.; Ingots and Slabs,
110; Best Selected, 112.50, and Pure Corrosion Ore,
106.50. Tin.—Banco, 265; Billiton, 262.50; Straits,
261.50; Australian, 262, and English, 262.50. Lead,
32 @ 38, and Spelter, 37.25 @ 38. Iron.—A higher
range of values at length seems to obtain in the
French iron market, for even in this city, where
prices have ruled so low, the price of Merchant
has now been raised to 13.50 francs @ 100 kg., and
Flooring Iron to 12.50. In the North all makers
appear resolved to maintain the current price and
reduce production. Old Rails cannot be had
under 7 francs. Puddling Pig remains quite low,
3.50 francs. In the Northern Department prices
have been firmly established at 12 francs, and
their raising to 12 francs seems imminent. Sheet
Iron is firm at 14 francs. There is an improved
outlook in the Haute-Marne; consumers are at
length coming forward to secure their require-
ments, induced by the rising tendency. Orders
have been numerous and large enough during the
week to require a month's production to fill them.
In the Champagne prices have steadied. Coal.—
Demand for Coal has been the reverse of active;
still there has been no further decline.—*Moniteur
des Interêts Matériels.*

BELGIUM.

BRUSSELS, June 10, 1886.—*Iron*—The agree-
ment among Belgian ironmasters did not at first
include the two biggest concerns, Cockerill and
Grignone, but since they have joined the syndicate
the situation has been strengthened, the more so
as a committee has now been appointed to keep
production within certain bounds under heavy pen-
alties. Should this step prove successful, the syn-
dicate will probably try to come to an understand-
ing with rolling mills in Germany with a similar
view. If carried out this would be an important
move in the right direction, and after a while the
iron industry on the Continent might in this man-
ner be once more put on a sounder basis. Prices
are meanwhile quite firm. We quote Luxembourg
Foundry Pig 10 francs, Charleroi 5.75; Puddling at
Charleroi commands 3.70 @ 4.70, and in Luxem-
bourg 38. Bar Iron is held at 16 francs, with 75
centimes difference between numbers, and 50
centimes if for export. Merchant No. 1, 10.50;
No. 2, 11.25; No. 3, 12. Beams may be quoted 10
francs; Angles, 11.50; Large Plates, 11.50; Sheets
No. 2, 12.50; No. 3, 14.50; Commercial 16.30; Thin,
18.50; and No. 4, 30.60 francs, all @ 100 kg.
The Braine la Comte and Savignone companies
have been adjudicated the building of the Cre-
mona, Italy, iron railroad bridge, which will weigh
some 10,000 tons, the cost being something like
5,000,000 francs. Coal.—The adjudication to furnish
the Government with Coal has established a very
low price, currently established since.—*Moniteur
Industriel.*

GERMANY.

HAMBURG, June 10, 1886.—*Iron*—The Rhenish-
Westphalian iron market has on the whole re-
mained depressed during the week. There is, it is
true, now and then a slightly better demand, with-
out, however, justifying great expectations for
the near future. In many instances competition
renders the depression in certain branches still
worse, and but few of them, through syndicates,
succeed in maintaining prices on anything like a
steady level. And syndicates for the reduction of
output are the best and only remedy to keep the
situation from still becoming worse. This seems
to be now acknowledged on all hands. We cannot
report very favorably on Pig Iron. There is less
Spiegel being shipped, a decline being cabled from
the United States, but the demand for France and
Belgium has improved; prices are, therefore,
tolerably well sustained. Puddling Pig has also
kept its own; in the Siegen district stocks are
partially exhausted. Prospects being poor, how-
ever, more blast furnaces are likely to be blown
out before this month comes to a close. Foundry
Pig remains unfavorably situated in consequence
of the little doing at foundries and machine shops.
Thomas moves off with a good deal of ease and
does not weaken. They quote 10 @ 12 1/2 Spiegel,
48 @ 49; Thomas, 38 @ 39 marks; Luxembourg,
38 francs. Rolling-mill products remain neglected
and low. The domestic demand for Boiler Sheets
is a little livelier, but not for export. Siegen Thin
Sheets are 1 mark cheaper, and Wire Rods are
still dull and depressed. Car-makers still have
sufficient work. Metals.—Spelter is in improved
demand; Copper quiet; Lead unaltered.—*Borsen-
halle.*

HOLLAND.

ROTTERDAM, June 7, 1886.—*Tin*—At the late Neth-
erland Trading Co.'s sale 25,782 slabs Banca aver-
aged 38 guilders @ 50 kg., and 1180 Billiton 57.604.
The favorable statistics of the last since stimulated
the demand, producing an upward movement
which has carried Banca to 59 and Billiton to 58.75.
—*Koch & Fleerboom.*

SPAIN.

BILBAO, June 7, 1886.—*Iron*—The market for
Iron Ore has lacked animation, but the demand
is now seemingly on the increase. Common Cam-
panil meanwhile selling at 6/6 and Superior Rubio
at 6/4 @ 7 ton. Freight is steady at the recent
slight improvement. Export to date, 1,377,880
tons, against 1,345,301 same time last year. Ship-
ments from Spain during the first two months:

	1884.	1885.	1886.
Tons.	Tons.	Tons.	Tons.
Calamine.....	5,456	12,356	7,842
Pyrites.....	158,735	206,359	172,696
Iron Ore.....	1,115,967	1,021,973	1,196,318
Ingots Copper.....	3,363	5,707	6,411
Quicksilver.....	768	489	295
Pig Lead.....	31,336	31,175	27,949
Total.....	1,315,985	1,277,969	1,411,494

—*Revista Minera.*

AUSTRIA.

VIENNA, June 7, 1886.—*Iron*—The iron market
here has been moderately active and steady. We
quote Pig 43 @ 34 floras @ ton; Merchant, 26 @
122.50; Sheets, 140 @ 175, and Beams, 100 @ 105.
There has been no change in Metals.—*Austrian
Trade Journal.*

EAST INDIES.

SINGAPORE, May 6, 1886.—*Tin*—Sales have been
very small, owing to continued scarcity, and the
price touched \$38.50, but is weaker again, there
being sellers to-day at \$38.30. Shipments last
month were small, and are not likely to be large
for this month. Tonnage.—The market is well
supplied, but rates tend upward. For New York
the August is accepting slightly lower rates for
light stuff, but the E. Accame quotes as before.
For Boston the Hoogby is loading. Exchange is
somewhat uncertain, but there is one buyer at
3 1/4% for six months' sight credits on London. Ship-
ments from the Straits Settlements to the United
States during the first four months 21,861 piculs,
against 12,689 in 1885; 22,967 in 1884; 1963 in 1883;
39,176 in 1882, and 63,913 in 1881.—*Gilfillan, Wood
& Co.*

PERANG, May 1, 1886.—*Tin*—Prices, in sympathy
with the London advance, improved from \$32.60
to \$33.05. Fortnightly receipts amounted to 5500
piculs, while there were sold to Europeans 5700
piculs and to Chinamen 3000.—*Schmidt, Kuster-
mann & Co.*

The Iron Age

AND METALLURGICAL REVIEW.

New York, Thursday, June 24, 1886.

DAVID WILLIAMS, Publisher and Proprietor.
JAMES C. BAYLES, Editor.
CHAS. KIRCHHOFF, Jr., Associate Editor.
JOHN S. KING, Business Manager.

RATES OF SUBSCRIPTION

INCLUDING POSTAGE.

THE UNITED STATES, BRITISH AMERICA AND SANDWICH ISLANDS.

Weekly Edition.....\$4.50 a year.
Issued every THURSDAY MORNING.Semi-Monthly Edition.....\$2.30 a year.
Issued the FIRST and THIRD THURSDAYS of every month.Monthly Edition.....\$1.15 a year.
Issued the FIRST THURSDAY of every month.

ALL OTHER COUNTRIES,

PER ANNUM, POSTPAID:

Weekly Edition: \$5.00—£1—25 francs—20 marks—12 florins—6 roubles (coln)—25 lire—20 pesos.

Semi-Monthly Edition: \$2.50—10/—12½ francs—10 marks—6 florins—8 roubles (coln)—12½ lire—10 pesos.

Monthly Edition: \$1.25—5/—6¼ francs—5 marks—3 florins—4 roubles (coln)—6¼ lire—5 pesos.

REMITTANCES

Should be made by draft, payable to the order of David Williams on any banking house in the United States or Europe; or, when a draft cannot be obtained, in postage stamps of any country.

NEWSDEALERS OR BOOKSELLERS

In any part of the world may obtain THE IRON AGE through The American News Company, New York, U. S. A.; The International News Company, New York, U. S. A., and London, England; or The San Francisco News Company, San Francisco, CAL., U. S. A.

RATES OF ADVERTISING:

ONE SQUARE (12 LINES, ONE INCH).

One Insertion.....\$2.50 One Month.....\$7.50
Three Months.....15.00 Six Months.....25.00
One Year.....40.00

PAYABLE IN ADVANCE.

BRITISH AGENCY:

Office of The Ironmonger, 42 Cannon St., London.

DAVID WILLIAMS,

PUBLISHER,

66 and 68 Duane Street, New York.

PHILADELPHIA.....220 South Fourth Street
THOS. HOBSON, Manager.PITTSBURGH.....77 Fourth Avenue
ROBERT A. WALKER, Manager.CHICAGO.....36 and 38 Clark St., cor. Lake
J. K. HANES, Manager.CINCINNATI.....Corner Fourth and Main Streets
HENRY SMITH, Manager.CHATTANOOGA.....Ninth and Carter Streets
S. B. LOWE, Manager.

REMOVAL.

The office of this journal is removed to 66 and 68 Duane Street.

The French Drawback System.

Quite an interesting struggle is going on at the present time in France over proposed changes in the drawback system of that country, which, so far as we know, has not been introduced by any of the manufacturing nations that rely upon a protective tariff to foster their industries. In many well to briefly review the history of the French drawback legislation, since it represents many of the different phases of a question which should be given some attention in the United States. The drawback system was organized by the law of the 5th of July, 1838, its principal feature being that it provided for the importation, free of duty, of foreign raw material to be used in manufacturing finished goods for export, with the reservation made that the latter be of the identical material. After frequent and pressing agitation it was decided to modify this, and the law of February 15, 1862, was passed, introducing what is generally known as the "French *acquit-a-caution* system." Under it raw material might be imported into any port of France in quantities equivalent to the actual amount required in producing a given article, allowances being made for waste. A certificate for duties paid was issued, which was negotiable, the sums it called for being paid out to any person exporting the corresponding quantity of finished goods from any other port of the country. Thus a producer of bar iron in the North of France might import English mill iron, and sell his certificate to a rolling mill on the Mediterranean, who would in selling ship-plates made from French pig for delivery in Italy obtain the amount of duties collected from his fellow-producers in the North. This law therefore brushed aside the identity clause and gave the exporter the advantage of sharing with the importer the saving in freight due to importation at the most accessible markets, and exporting from ports nearest to competitive points. The law of 1862 included in this system pig iron, scrap and old iron, blooms, billets, &c., but the Government yielded to the protests of some sections, and restricted the *acquit-a-*

caution system to pig iron alone, again enforcing the identity clause for the other raw materials by an act passed on the 9th of January, 1870.

Last fall the pig-iron manufacturers of Eastern France entered an energetic protest against this last remnant of the old *acquit-a-caution* system, alleging that their markets were invaded by foreign competitors, who pay only a small premium to exporters of French manufactured iron and steel, while the greater part of the drawback in reality goes toward practically annulling the benefits of the duty. The French Government submitted the question to its Board of Arts and Manufactures, and they in turn called for an expression of opinion from the leading Chambers of Commerce. The replies are of course contradictory, since the interests of different sections are variously affected. The effect of the system is to aid the manufacturers of some parts of the country at the expense of the makers of raw material in others. Let it be assumed for the sake of illustration that this method of making drawbacks were in vogue in the United States, and that there existed an extensive iron trade on the Pacific Coast, shipping a considerable proportion of its product—say, miscellaneous castings, hardware and manufactured iron—to Australia, India, China and Japan. The result would be that heavy quantities of foreign pig iron would be brought into ports on the Atlantic Coast, the importers selling their drawback certificates to exporters on the Pacific Coast at prices ruled by the supply and demand. An urgent inquiry for them would amount to a premium on imports, or, what is the same thing, a sharper competition of foreign pig against the domestic article in the Eastern markets. The pig-iron manufacturers of the Atlantic States would therefore be practically sacrificing a part of their own market to aid rolling mills and foundries thousands of miles away to compete with foreign rivals at the antipodes. It will be understood, then, how vigorous are the protests from the North of France, threatened by English iron, and from the East, where the cheap German pig presses on the market, and how anxious are the manufacturers of iron who have an outlet on the Mediterranean to perpetuate the existing condition of affairs. Yet there may be circumstances where the French drawback system may prove beneficial to all concerned, notably in this country of magnificent distances. Our own drawback laws are exceedingly crude. They not alone contain the identity clause about which, of course, there may be much dispute, but they also provide that 10 per cent. of the duty collected be retained by the Government. Is it only just that the cost of collecting the duty in the first place, and of watching that there is strict compliance with the law, be charged to the manufacturer, but it is absurd to claim that this amounts to anything like 10 per cent. of the full duty. A reduction to one-half or even one-quarter of that amount would in many cases put American manufacturers in a position to carry off business in neutral markets in which they cannot now compete.

During the past few weeks a compilation has been going the rounds of the press which shows considerable activity in the building of new blast-furnace plants in the South, where undoubtedly the most rapid extension of capacity is going on. It is significant that the majority of these enterprises have been initiated by men already deeply interested in the young iron industry of Alabama and Tennessee, and we know of only one case in which such ventures are based on an apparently inadequate financial foundation. This speaks well for the past results in iron-making there, and augurs well for the future. It proves that the South does not need the "boomers," and the only fault we have to find with the leading representatives of that section is that they do not more vigorously discountenance their over-sanguine associates. Too much zeal is dangerous, and this could not be better illustrated than by quoting the following table, printed in an article on the wonders of Birmingham, Ala., in a recent issue of the New York World:

Iron Furnaces.		Daily capacity, tons.
Name.	No.	
Sloss Furnace.....	2	125
Sloss Furnace.....	2	125
Alice Furnace.....	1	60
Alice Furnace.....	2	140
Eureka Furnace.....	1	80
Eureka Furnace.....	2	70
Mary Pratt Furnace.....	1	60
Woodward Furnace.....	1	125
Williamson Furnace, now building.....	1	60
Pratt Furnace, now building.....	1	70
Pratt Furnace, now building.....	2	140
De Bardeleben Furnace, preparing to build.....	1	100
De Bardeleben Furnace, preparing to build.....	2	100
Thomas Furnace, preparing to build.....	1	100
Thomas Furnace, preparing to build.....	2	100
Totals.....	21	1,475

It may be confessed that these totals at first looked startling, but a closer examination will prove them to be based on a principle which would give a plant of five furnaces in a row as they exist elsewhere in this country the beautiful total of 15. The local statistician who has provided the material to the unsophisticated reporter of the World probably meant to convey to that enterprising person that Sloss No. 1 had a capacity of 75 tons per day; No. 2, 125 tons; No. 1 Alice, 60 tons, and No. 2 Alice, 140, &c. Calmly adding these figures, and accepting a somewhat exaggerated estimate of capacity, the World expert reaches the

total quoted, when in reality there are only eight furnaces built, three building, three still in the earliest stages of construction, and one is only planned as a possible future contingency. The World has discounted the future pretty thoroughly, and the furnacemen of the Lehigh and Schuylkill valleys will be allowed at least a year before the Birmingham district will invade their markets with a share of its estimated product of 1475 tons daily. Last month the furnaces running enumerated above did not quite make 500 tons per day.

Limited Partnerships.

Those who put capital into limited partnerships will do well to take the greatest care that the details of the law in regard to the formation of such concerns are strictly observed and scrupulously carried out. In the light of recent litigations there would seem to be either much laxity and want of prudence or profound ignorance of the law. The special partner frequently finds that his immunity from personal liability for the debts of the firm, which it is the purpose of such a partnership to secure, has been vitiated by some defect of organization, or some act connected with the management of the business. When we speak of a limited partnership it is perhaps necessary to distinguish it from a limited company. The difference is quite important in its effect upon the rights and claims of the parties. A limited company is a corporation with a system of joint stock, and acts through elected officers. It is called "limited" because, as in most corporations, the liability of its stockholders for debts of the company is confined to the par value of the stock held by each. But a limited partnership is like any other partnership, and is managed and the business done in its name as such, and its members, with the exception of its special partner or partners, are personally responsible for all debts contracted. The great advantage and value of such an arrangement is that it enables capitalists who cannot or who do not desire to engage in active business themselves, and who will not imperil their whole fortune by forming a full partnership with limited liability, to advance money to a struggling enterprise, and at the same time become a dormant partner, with the right to share in the profits made, willingly taking the risk, in case the enterprise is unsuccessful, of losing the amount put in, because they know that they can lose no more than that amount. The effect on business in general of the employment of capital in this way is undoubtedly beneficial. It stimulates trade, gives employment to labor, puts so much more money into circulation, and it is sometimes the only method by which an infant industry or newly-formed business is enabled to grow and extend its operations.

It is not at all surprising, therefore, that so many partnerships of this kind have been formed in recent years all over the country. But it is surprising that there should be such vague ideas in regard to the nature of the relation and the method of legally contracting it. A limited partnership in all the States is a creation of statute. These statutes specify the necessary step of procedure. They point out what must be done in order to protect the special partners. And if any of these things are omitted, if the statutes are not strictly complied with in every respect, the partnership is not "limited," but all the members, including the intended special, become liable to the fullest extent. There is no other way in which a limited partnership can be formed. No mere agreement between the partners will have that effect. No ignorance of the law will excuse. It may be thought that this strict construction and application of the statute is too harsh and severe. The theory of the law is that, if the liability of a partner is to be limited at all, the system should be hemmed in by safeguards. Nothing would be more easy than for a member of a firm when sued to set up that he was a special partner, in case a private agreement were allowed by law. Therefore, for the protection of creditors and to prevent fraud it is held that this strictness should be maintained, and it will be noticed on examination that all the provisions of the statutes have this object in view.

In most of the States two or more persons may form a limited partnership for almost any business except insurance or banking. There may be any number of special partners, but there must be at least one general partner, who shall be responsible for the debts of the firm to the full extent of his individual assets. The general partner must be the only one to manage the business. The special partner has no right to interfere. More than this, if he does interfere he will become liable as a general partner. He has a right to examine the books and give advice, but he cannot control or direct. He cannot even be employed as an attorney or agent by the firm without losing the protection of the statute. The names of the special partners, moreover, must not appear in the firm style or title, but it is usual for their names to be printed in smaller letters on the signs and letter-heads, followed by the word "special." In some States the law positively requires this. If there is only one general partner, the words "and Co." cannot be used, nor can they be used in any case to denote the special. The method of formation is not so simple as is the case with an ordinary part-

nership. There must be a certificate drawn up and executed by the partners in accordance with the provisions of the statute. Usually this contains the name of the firm, a description of the general nature of the business, the names and places of residence of all the partners, general and special, the amount of capital contributed by each special partner, and the period during which the partnership is to last, specifying the dates on which it is to commence and on which it is to terminate. There must also be an affidavit made by one or more of the general partners to the effect that the sums specified in the certificate have been actually and in good faith paid in cash.

This certificate, together with the affidavit, must be acknowledged before a notary public, like a deed or mortgage, and then filed or recorded in the office of the clerk of the county where the business is to be carried on. The terms of the partnership must then be published in two newspapers, once a week for six weeks. All the material facts, such as the amount of capital contributed, must be published. Any failure to comply with these rules is a vital defect. The provision of the law across which business men have stumbled most frequently is the rule which requires the capital to be paid in cash. This must be done on or before the first day on which the partnership commences. The meaning of the word "cash" is often misunderstood. The cases hold that it must be money. One State, Pennsylvania, allows the special partner to contribute goods, but in no other State is such an arrangement good. The check of the special partner is not cash, even though there is money in the bank to pay the check, unless the general partner draws out the money before the first day. It has even been held that a certified check will not answer. In the case of Durant against Abendroth, decided in New York, the facts were these: The certificate and affidavits were filed on December 23. The former stated in usual form that the special partner had actually and in good faith paid in \$10,000 in cash. The partnership was to commence on January 1. Abendroth, as a matter of fact, only gave his check for the amount, which was not paid until January 2. On the failure of the firm the special partner was held liable in the same manner as a general partner for all the debts of the concern. It was said by the court that neither the honest intention of the parties that the sum should be paid at the time of the commencement of the partnership, nor the good faith manifested by the actual payment, nor the consideration that no injury resulted to the creditor from the fact that the statement was untrue, could remedy the defect. In like manner any error in the publication of the terms, even if unintentional, has the same damaging effect. Thus, where the amount contributed by the special partner was published as \$5,000, when in reality it was only \$2,000, the special partner was compelled to pay the debts. In this case, however, if the error was due to the negligence of the publisher, the special would have the legal right to recover from him the amount of damage he himself sustained. The special partner, moreover, cannot impair the assets of the firm by withdrawing any part of the capital which he originally put in. He cannot receive dividends or interest unless the earnings of the concern justify it. But he may loan money or credit to the partnership and hold it like any other creditor, except that in case of the insolvency of the firm no special can claim as creditor until all the other creditors are satisfied. And no limited partnership can make an assignment with preferences to any particular creditor. All the creditors must share equally. Any attempt to make it otherwise, with the knowledge and consent of the special partner, is followed by the usual penalty.

The claim is advanced incessantly during times in which prices and wages are low that the first effort of employers is to scale down the latter, to compensate for a prospective decline in profits. It is urged, and apparently the body of workmen believe it, that they must first bear the burden of bad times, and that it is only when manufacturers dare not demand a reduction of wages that their returns on investments are attacked. It is an axiom, too, with agitators and labor reformers that, being more helpless, common labor is ground down more mercilessly than the skilled workman. It is not often that figures are available to clearly show the fallacy of such a position, and special interest attaches, therefore, to valuable data which are likely to have escaped general attention, since these are published in the last volume of reports of the Bureau of Statistics of Labor and Industries of New Jersey, a document probably rarely consulted outside of the confines of its own State. Mr. Frederick J. Slade, treasurer of the New Jersey Steel and Iron Co., of Trenton, has compiled a diagram appended to the report, showing the changes in the selling price of iron and in the rates of wages paid by that concern for 15 years. In 1872, when the selling price of finished iron was \$97.63, the puddlers' earnings were \$4.94 per day, those of the small mill heaters were \$7, while common labor commanded \$1.40. In 1885 the price of iron had been reduced 58.7 per cent., the wages of the heaters had fallen 48.7 per cent., and those of the puddlers 43.1 per cent. In the meantime the wages of laborers had de-

clined only 28.5 per cent. The earnings of the highest paid classes, those of the heaters and puddlers, follow the fluctuations in the price of iron much more closely as a general rule, though the former continued to decline in 1885 to \$3.59, while the puddlers remained stationary at \$2.81, in spite of a fall from \$41.63 to \$39.37 in the price of iron. We have no doubt whatever that if the data were available the line reflecting the ups and downs of profits would indicate in much more exaggerated form the vicissitudes to which the other figures are subject.

English Exports to the United States.

The Board of Trade returns for the first five months of 1886 show clearly how opportunity have been to English ironmasters the increased sales of iron and steel to this country. The following shows the total exports from Great Britain for the first five months of the year:

Exports of Iron and Steel from Great Britain—Five Months.

	1885.	1886.	Inc. +
Gross tons.	Gross tons.	Dec. —	Per ct.
Pig iron.....	354,932	365,543	+ 2.9
Bar, angle, bolt and rod.....	106,679	95,497	- 10.4
Railroad iron.....	291,719	272,848	- 6.4
Wire.....	21,312	18,531	- 13.0
Hoops, sheets, boiler and armor plates.....	121,451	118,839	- 2.1
Cast and wrought iron.....	134,915	143,338	+ 6.2
Old iron.....	27,138	52,987	+ 95.2
Steel, unwrought.....	21,119	39,179	+ 85.5
Tin plates and sheets.....	127,949	143,552	+ 12.4
Manufactures of iron and steel combined.....	5,336	4,557	- 14.4
Iron rails.....	5,884	4,924	- 19.9
Steel rails.....	203,301	160,302	- 21.2

There has been a decline in almost every item in which we are not purchasers, and wherever there has been an increase the heavier sales to this country are either largely or entirely responsible for it. The following table has been compiled to illustrate this fact. It gives the shipments to this country and the percentage which they constitute of the total exports:

Exports from Great Britain to United States, Five Months.

	1885.	1886.	Percentage of total exp'ts.	1885.	1886.
Gross tons.	Gross tons.	1885.	1886.		
Pig iron.....	45,254	118,917	12.7	32.3	
Bar, angle, bolt and rod.....	795	1,762	0.7	1.8	
Railroad iron.....	5,044	10,484	1.7	3.8	
Hoops, sheets, boiler and armor plates.....	2,645	3,576	2.2	3.0	
Cast and wrought iron.....	611	792	0.5	0.5	
Old iron.....	3,473	25,312	12.8	47.8	
Steel, unwrought.....	5,052	18,556	23.9	47.4	
Tin plates and sheets.....	97,680	116,567	76.3	81.0	
Steel rails.....	4,843	10,114	2.4	6.8	

The most prominent increase has been in the case of pig iron and of old material. So far as the former is concerned, we have been taking from Great Britain during the first five months of the year nearly one-third of its entire exports, against one-eighth last year. Much of this business was done during the excitement last fall, and the long period of dullness in Bessemer pig indicates that for months to come this rate of shipments will not be kept up, the arrivals probably being limited more than lately to speigleisen and a small quantity of Scotch foundry irons. Our furnaces using imported ores are underselling the foreign metal, the difference in duty being as about \$1.10 to \$1.20 per ton on the iron in the ore to \$6.72 per ton on pig iron. The old-material imports will surely fall off during the next few months, while steel rails will probably show an increase. It must be remembered, however, that during the balance of this year the shipments to Southern ports on Mexican account will be large, and should not deceive those who superficially examine the returns. We may add that rails are also included in "railroad iron," the figures for rails being a special return. The exports for tin plates are significant. Until now this year we have been taking not less than 81 per cent. of the total exports from Great Britain.

It may be of interest to note in this connection what valuable buyers to the ironmasters of Great Britain are the leading colonies, which we have grouped as under, covering the period of five months:

Material.	British North America.		East Indies.		Australasia.	
	1885.	1886.	1885.	1886.	1885.	1886.
Pig iron	9,942	11,012	Not specified.		Not spec.	

The greater value of this trade lies in the fact, particularly so far as the East Indies and Australasia is concerned, that it is in the more finished forms of goods.

Steam has become so extensive in its application to power purposes that the advantages to be derived from the employment of some other agents are frequently overlooked. Until recently this was particularly true as regards wind-power, and it is only a comparatively short time ago that engines designed to utilize it commenced to attract the attention of engineers to questions connected with this class of motors. At present, however, the windmill enjoys a fair degree of popularity, and good work is being done by it in many places where more expensive devices were formerly used. In making an estimate of the cost of working it must be remembered that, as there is no fuel item, the expenses of wind-power consist principally of interest, repairs and depreciation of

plant, oil and attendance. The last, moreover, is a small item and calls for little, if any, skill. Five per cent. per annum has been assumed to cover repairs and depreciation, and 5 per cent. more to cover interest, and with these figures the economy of the windmill for certain kinds of work, as, for example, pumping water into tanks, drainage, &c., has been strikingly shown. A better appreciation of the importance of these facts will stimulate in a great measure the growth of the windmill industry, and will secure the adoption of the motors for work which they are well adapted to perform, and which, without them, is often carried out with difficulty and unsatisfactory results.

Tariff Revision.

Mr. Morrison is "crushed again." Year after year during a conspicuous, but not prominently useful, Congressional career he has come to the front with his little bill to reconstruct the entire tariff system of the country. The thought that the great American people were groaning under the burdens of war taxation and awaiting the coming of Morrison the deliverer, has probably kept him awake nights. Like all great reformers he is proof against discouragement. Repeated and emphatic assurances that the people do not want deliverance at his hands have only intensified his desire to render his oppressed fellow-countrymen this distinguished service—and, incidentally, do British manufacturers a favor which they would certainly appreciate. This year Mr. Morrison felt certain that the supreme moment of his career had come, but again Congress has quietly, but effectually, sat upon him and his little bill. No doubt, like the unhappy possessor of a smashed hat, he will ask the house to oblige him by rising that he may recover it; and after punching out the dents and restoring it to a semblance of its former shape, will again offer it. If so it is probable his honorable colleagues will amuse themselves by playing foot-ball with it and finally kicking it out the window. We do not know that we have any occasion to deplore Mr. Morrison's misfortunes as a tariff reformer. The spirit in which he approaches the work he has assumed is not that which commands or merits the confidence of the American people. There is a vast difference between the honest tariff reformer and the man who is continually trying to enter the thin edge of the free-trade wedge, when driven home, is to split our industrial system asunder. Having no sympathy with the principle of protection to home industry, Mr. Morrison is not one who can be safely trusted to reconstruct the schedules of the tariff and correct its inconsistencies.

And now Mr. Randall takes his turn at the work. That he has had an important share in defeating the consideration of Mr. Morrison's bill and saving the country a tedious and profitless tariff debate, is something of which Mr. Randall should be proud; but the attacks upon him by newspapers with free-trade proclivities seem to have impressed him with the idea that he needs to vindicate himself from the charge of an unintelligent and dishonest partisanship in the protectionist cause. To show that he is not ignorant of the fact, or unwilling to admit, that the schedules and administrative provisions of the tariff can be advantageously modified in some respects, and made at once more consistent and more in harmony with the present state of the arts, Mr. Randall proposes to introduce a tariff bill which shall show the country what sort of a measure he and his friends are willing to support. This course of action seems to us unnecessary and not a little dangerous at this time. The critic who condemns a bad picture does not need to vindicate the intelligence of his judgment by accepting the challenge to paint a better one. The session is drawing to a close, and there is not sufficient time for the proper consideration of a tariff bill. No good could come of its introduction except to give Congressmen a chance to make the speeches they have prepared for the edification of admiring constituencies. Mr. Randall's bill is not to deal exclusively with internal taxes, but with customs charges and regulations as well. Speaking of it, Mr. Randall says: "The bill will have certain provisions of reform in administrative methods which are not based upon mere speculative notions of improving the efficiency of the means of collecting the revenues, but are the results of practical experience in the workings of that branch of the service. These are simple and easily understood, and will render frauds practically impossible and facilitate official business. The bill also equalizes duties and corrects many of the incongruities of the present statutes. This is an important feature. It does not propose to reduce duties, but to equalize them, and in no instance has the idea of protection of American industry been lost, but, in fact, raises duties in some instances where obviously necessary." Of the metal schedule Mr. Randall says:

The notion of free raw material is entirely discarded. The labor engaged in those branches of industry is just as much entitled to consideration as in any other branch. Pig iron, copper, lead and nickel will not be disturbed, although pig iron, in justice to labor, might be increased slightly in order to give the labor in furnaces proper consideration. There are several forms of manufactured iron which require an increase of duty as a matter of self-protection. In iron beams, for instance, the Belgians have already run England out. Even the starvation rates of wages in England do not enable the English manufacturers to

withstand the competition of Belgian beams, and we now find them coming into our markets and driving our home production out even at the low prices of our home article. I believe contractors in some places are using these Belgian beams in our public buildings. As for tin plate, that is a vast industry in the United States, consumes a large amount of partially manufactured material, and employs millions of capital and thousands of hands. It is proposed to raise the duty on tin plate, as it was reduced to a practically free-trade rate in the existing statute. Steel rails, now \$17 a ton duty, can stand a reduction, as our processes of manufacture and mechanical appliances are such as to overcome foreign competition at a lower duty without affecting labor. You must understand that the great metallurgical industries of the country will not be disturbed, except where it is for their benefit, and particularly in highly finished articles like cutlery, now almost driven out of the market by cheap, worthless foreign cutlery, entered through undervaluation and perjury.

Mr. Randall further says that wool is not to be put on the free list, and that no changes will be made except where they have been suggested by the experts who have had the details in charge, and with the acquiescence of the parties interested. "This is to be a practical bill and treats the whole subject and everything in it from a practical standpoint. This may be said to apply to articles under the general classification of cotton and cotton goods, pottery in all its branches, silk and silk goods, woolen goods, wood and all other articles which may be embraced in the bill."

This is all very interesting, but we still think that if Mr. Randall felt impelled to bring in a reasonable tariff bill he should have done so early in the session. At this stage his measure has no chance, and next year it may prove an embarrassment.

The decline in silver has become a matter of alarm to many, the price during the past months being the lowest on record in the London market. It is beginning to shake the belief of some even of those who insisted that if we continued to coin \$2,000,000 monthly under the provisions of the Bland bill the metal could be rehabilitated. The fall has been going on at a very rapid rate of late, and it is interesting to note how much intrinsically the value of the standard dollar has fallen. The accompanying table gives the price of silver, 925 fine, in the London market, and the value of the silver in the Bland dollar for a series of years, in semi-annual averages, and the increase for the first five months of 1886:

	925 fine. Pence.	Stan. dol. Cents.
1877, first half	53.30	93.58
1877, second half	54.45	92.31
1878, first half	53.38	92.21
1878, second half	51.32	87.02
1879, first half	50.54	85.69
1879, second half	50.05	84.85
1880, first half	52.29	88.96
1880, second half	52.28	88.55
1881, first half	51.66	87.58
1881, second half	51.65	87.50
1882, first half	52.05	88.25
1882, second half	51.55	87.40
1883, first half	50.68	85.60
1883, second half	50.68	85.60
1884, first half	50.89	86.28
1884, second half	50.44	85.52
1885, first half	49.24	83.50
1885, second half	47.94	81.30
1886, January	46.73	79.23
1886, February	46.68	79.15
1886, March	46.78	79.33
1886, April	46.39	78.64
1886, May	45.41	76.99

The dangers and the inconvenience of the continued coinage of the Bland dollar have been so frequently dwelt upon that it is quite unnecessary to emphasize the teachings of this series of figures. The pressure which low prices of silver exert in other directions has long been clear in some branches of trade. We need only allude to the advantages it gives to the producers of copper in Chili and the effect it exercises upon the competition of India for the grain trade of Europe.

A few hours after we had gone to press last week the signatures were appended to the greater part of the scale which is to be the basis for the payment of wages in the greater number of the iron works in the West for a year to come. The roll-turners' scale, which was one of the new features brought forward by the Amalgamated Association, was held back with the understanding that it is to be taken up next year. The discussion of the nailers' demands was deferred until to-day, the 23d, when the Western Nail Association will join in the conference. The scale accepted by both parties represented in nearly identical with that of the preceding year. In the guide, 10 inch, hoop and cotton-tie mills the base price is changed from a 4½-cent to a 2-cent card rate, the scale, however, remaining practically the same with a few slight alterations. The principal advance has been in the tin and block plate mills. The report that the manufacturers of the Mahoning Valley would appoint a conference committee to meet a similar body from the Amalgamated Association is without foundation, as they will sign the scale when presented.

The New England Manufacturers' and Mechanics' Institute building, in Boston, recently purchased by the Metropolitan Horse Railroad and used by the company as a storage and repair shop, was entirely destroyed by fire on Monday, causing a loss estimated at \$400,000. Eight workmen lost their lives, and the property burnt comprised 400 horse cars. The building was erected in 1881 for exhibition purposes, and covered 5 acres, its lateral extent being 250 feet. The space bounded by the gallery fronts was 400 feet long and 126 feet wide, clear of columns, and open to the roof, which was 80 feet above the floor.

The Philadelphia Rolling Mill Association met on Monday afternoon, and considered the ultimatum of the 1500 ironworkers employed in the rolling mills for the establishment of the 2-cent basis.

THE WEEK.

R. M. T. Hunter, of Virginia, formerly regarded as a Nestor in diplomacy, is now a poor old man, a collector of customs at a small port at the mouth of the Rappahannock River.

The loss by the burning of the Missouri Car and Foundry Co.'s works is estimated at not above \$80,000, which is much less than first reported.

A decree of foreclosure against the Howe Sewing Machine Co., of Bridgeport, was passed by Judge Beardsley last week, to satisfy the amount of \$280,000, in the case of Wm. H. Rockwell and others.

A San Francisco paper, in an appeal to Congress for a subsidy for a steamship line between this port and the Australian colonies, prints what it terms a remarkable exhibit, showing that our Australian exports have increased in the two years ending December 31, 1885, from \$6,500,000 to \$11,500,000. The balance of trade in favor of the United States increased in the same period from \$4,500,000 to \$9,000,000.

The United States steamer Alliance, after being nine months at Norfolk under repairs, was placed under steam last Friday, and a crack 14 inches long was discovered in her shaft.

Acting Secretary Fairchild, in a letter to Representative Breckenridge, of Kentucky, in regard to the estimated receipts and expenditures for the next fiscal year, says that the amount of refunds to be paid under the Oberteuffer decision as to the duty on cartons is estimated at between \$4,000,000 and \$5,000,000. He says further that the item of \$4,000,000 specified in the book of estimates is for the ordinary and usual repayment to importers of excess of deposits upon ascertained duties or upon duties and other moneys paid under protest. Consequently the estimated sum, he says, should be increased to about \$8,000,000 or \$9,000,000. He explains that the item of \$8,000,000 for debentures cannot be used for the payment of claims under the Oberteuffer decision or otherwise, except as drawbacks on imported material exported in the form of manufactures.

Sperry & Barnes' pork-packing house, in New Haven, was burned 16th inst., and the loss, including provisions and machinery, is estimated at \$300,000.

The city of Vancouver, British Columbia, which suddenly sprang into existence at the Pacific terminus of the Canadian Pacific Railroad, was destroyed by fire 13th inst. It had a population of about 3000. The loss is estimated at \$1,000,000. Reconstruction has actively commenced.

One of the largest gas wells known was struck at Grapeville, Pa., last week. At a depth of 1125 feet the drill entered the gas vein or reservoir, when the upward rush from the well became almost irresistible, deafening the workmen with its shrieks. The tools, weighing 2500 pounds, were not blown out, but held suspended by the pressure beneath. At last accounts efforts were being made to introduce 4 inch iron casing to bring the gas in control.

Californians are troubled by a drop of 5 cents to 7½ cents per bushel for wheat within about a fortnight, which means a loss of \$1,800,000 on the new crop.

There is said to be money at Suez for the first parties who establish there the manufacture of 1 and 2 gallon tin cans for the Egyptian oil producers.

The imports into Paraguay last year are returned at \$1,448,100, and the exports at \$1,572,300, showing a balance in favor of that country of \$124,200.

The President approved the act authorizing the construction of a bridge across the Staten Island Sound, known as Arthur Kill, and to establish the same as a post road.

Mr. Frye's bill to promote the political progress and commercial prosperity of the American nations, as passed by the Senate, authorizes the President of the United States to invite, on behalf of the people of the United States, delegates from Mexico and Central and South America to meet in Washington, October 1, 1887, to meet delegates on the part of the United States, to consider such questions and recommend such measures as shall be to the mutual interest and common welfare of the American States. One hundred thousand dollars is appropriated for the incidental expenses of the conference. The delegates of the United States are to be 24 in number, and are to serve without compensation.

Among the bills signed by the Governor is that amending the law regarding imprisonment for debt. Hereafter six months is to be the limit of imprisonment on arrests in civil actions, and the operation of the law releases all prisoners in Ludlow Street Jail, New York, and elsewhere who have been incarcerated beyond six months.

Jacob Reese, the metallurgist, who recently returned from Tennessee, in a conversation remarked: "Those Tennessee folks have the fuel-economy idea down rather fine now. They are making pig metal with charcoal as fuel. They burn the wood into charcoal in closed kilns, and the vapor distilled from the wood is conducted into a

receiving tank, where the tar is deposited, and then passes into a condenser. About 2 gallons of tar and 4 gallons of wood alcohol are obtained from each cord of wood. There is also a considerable amount of pyrolytic acid obtained which now runs to waste. This could very readily be converted into vinegar at but little expense."

The inaugural address of President Hall, of the New York Board of Fire Underwriters, presents some interesting facts in regard to the fire-insurance business in this city. It appears that the insurance values have doubled within 20 years, but the aggregate net receipts from premiums have decreased in the same time from \$8,222,845 to \$5,887,577. The fire losses within the last five years, notwithstanding the increased cost of the Fire Department, were greater than in any previous five years of which there is record. The shrinkage in net receipts from premiums, Mr. Hall says, is due in considerable part to increased commissions to brokers. These range from 35 to 40 per cent. President Hall's position is that a premium rate which contemplates such excessive brokerage cannot be justified.

Memoranda kept by the United States steamship inspectors under the law of 1882 afford a tolerably close estimate of the amount expended at this port by the foreign steamships. It is made the duty of the inspectors to provide extra equipments and improvements such as they may deem necessary, and in most cases it is probable, they insist, that repairs shall be made in this port and the materials be obtained here. It has even been said that they sometimes order a steamer into dry-dock when wholly unnecessary, but the amount thus dispersed appears to be very trifling compared with expenditures in older times, when American ships gave a handsomely remunerative business to scores of sail-lofts and ship-chandlery stores along the river front. During the year 1885 the inspectors examined 148 vessels, aggregating 334,043 tons. The number of boilers examined was 600, donkey boilers 147, and the number of visits made to the various steamers for the period named was 1072. The amount of disbursements for the year on account of repairs and equipments is estimated at \$300,000. For the present year to date the amount is put down at \$164,423.

Ex-Minister Benjamin, formerly at Teheran, evidently regards with distrust the reported railway concessions to Mr. Winston, who recently resigned that office. He says: "Privileges similar in substance to those recently reported to have been granted to the present United States minister in Persia were repeatedly offered to American capitalists through the medium of the writer, but a careful examination of the ground convinced me that it would be inexpedient to urge our capitalists to invest money in Persian railways at present, with the possible exception of local tramways. Aside from the vast outlay required, they were sure to be opposed by Russian intrigue unless operated in her interests, and opposed in turn by England if they did so co-operate with Russia. These conditions continue unchanged." Mr. Benjamin says the archives of the legation show that the number of citizens of American descent resident in Persia averages over 70.

The New York sealers and inspectors of weights and measures are unusually active of late, having turned into the city treasury a considerable amount of fees collected, although until now the revenues from this source were apparently lost, if, in fact, the law was not practically dead.

The French flag was raised at the New Hebrides by a naval commander, apparently with the design of establishing French authority in the islands, but it was ordered down by the minister at the Tuileries. The Comoro Isles, which have just been formally ceded to France, will strengthen her hold in Madagascar waters, as they lie between the great island and Africa, in Mozambique Channel. Those of importance are four in number, and contain perhaps 70,000 people, with some manufactures and a very considerable cultivation of sugar, now an export.

The flint, bottle and window glass workers of this country and Canada will meet in convention during the next two weeks. The most important matters to come up are the wage question and some changes in the mode of working. It is thought that but little change is contemplated in the matter of wages.

A subterranean lake of salt water was struck at a depth of 2400 feet while boring for gas at Akron, Ohio. No bottom was reached after paying out 1000 feet of rope, the drill encountering no resistance.

The Paterson Board of Trade have decided to establish a permanent board of arbitration for the settlement of questions between workers and employers in that city. The proposition comes from Mr. Strange, one of the most prominent workers in silk, whose men went out not long ago at the beck of a walking delegate from the cigar manufacturers.

Recorder Smyth has just given a decision on the demurrer entered some days ago by Gen. Roger A. Pryor in the case of George Lenhardt and 46 others, recently indicted for conducting a boycott against Cavanagh, Sanford & Co., the Twenty-

third street tailors. General Pryor entered the demurrer on the ground that the indictments did not read in accordance with the law as laid down in the Penal Code. The Recorder decides that the indictments are correct and that the men must be tried.

The Cuban sugar crop, now nearly finished, will probably equal that of 1873, the largest ever made on the island. Exports already amount to 300,000 tons, and stocks at all the ports add up over 400,000 tons, which will be still further increased.

A dispatch from Ottawa, Ont., states that the Dominion Government have commenced the organization of regular customs ports in the Northwest Territories, on a basis similar to that which exists in the Eastern Provinces.

The Cape Cod ship canal, it is again stated, will be pushed through to completion, Fred. A. Lockwood, the contractor, having obtained the necessary funds in New York.

The Senate on Friday passed the Frye Mail Subsidy bill without debate. The bill allows 50 cents per mile traveled by American vessels in which the mails are transported, and is substantially the same as the Senate amendment to the Post Office Appropriation bill, which is now in conference.

Coffee boiled in copper-bottomed kettles in which water had been standing 20 hours sickened almost fatally a large number of men who participated in a military reunion at Reading, Pa., last week. The difficulty was first charged to corned beef, impregnated with imaginary tinner's solder.

Nova Scotia has voted overwhelmingly in favor of secession from the Dominion, although she favored the confederate scheme when it was adopted 19 years ago. The special election held last week was in pursuance of a resolution moved by the Premier in the last local legislature, recently dissolved, and out of 38 seats the repealers obtained 31. The question now is as to what the repealers will do with their victory. According to the tenor of advice just received from England, the Imperial Government wholly disapproves the course of the Dominion touching the fisheries question.

One of the great iron hydraulic dredges employed by Benson & McNe on the Potomac flats caught fire from the explosion of a lamp and was destroyed. Loss, \$35,000.

The Stevens Institute of Technology, at Hoboken, on the 17th graduated 34 students. Salutatory address by Henry B. Everhart, the valedictory by C. Russell Collins. The subjects of the theses, written by graduates receiving the degree of mechanical engineer, varied from "The Manufacture of Sugar" to "Experiments in the Field of Electro-Motive Force of Armatures of Dynamo-Electric Machines."

Like ex-Minister Winston, at Teheran, Minister Childs, at Bankok, is anxious to be relieved of his official station.

The new bridge of the Baltimore and Ohio Railroad Co. across the Susquehanna River at Havre-de-Grace, Md., is asserted by the Havre-de-Grace Republican to be the longest bridge in the United States, and, with one exception, the longest in the world. It is 6315 feet in length, and river spans alone cover 3920 feet.

The repairs of the English steamer Eros, at Cramp's yard, cost \$50,000, and, as an American register is now permissible, several parties are said to have made overtures for her purchase. This manner of obtaining "free ships" is an encouragement to local industry.

The Manual Training School in Philadelphia has 142 applicants for admission at the close of its first year. The examinations include forging, welding, tempering, soldering, brazing, molding, casting and the proper care and use of tools.

A committee of the Real Estate Exchange reports that the old building known as the register's office in the City Hall Park is in such a condition that valuable records, maps, &c., involving the titles of properties of enormous extent, are perishing from exposure, liable to be wholly destroyed by fire at any moment, and recommend that immediate steps be taken for the erection of a fire-proof structure.

Representative King, of Louisiana, introduced in the House on Monday a bill appropriating \$11,000,000 for the construction of coast defenses, to consist of revolving steel-turreted forts at the entrance to important harbors. The first appropriation is to be followed by yearly appropriations of \$5,000,000 until the system of defense is perfected.

The lowest bid for enlarging the Metropolitan Museum in Central Park amounts to \$345,685. As only \$325,000 has been appropriated, the contract has not been awarded, and the competition will probably be reopened.

The Catholic bishops of Quebec denounce the Knights of Labor.

About 2000 laborers employed on the aqueduct between Croton Lake and Irvington struck on Monday in consequence of the appointment of J. A. Latcha, a civil engineer, to succeed D. D. McBean as manager. The contractors are Brown, Howard & Co., and the work, which covers 13 miles, is about half finished.

NEW AND IMPROVED BUFFALO CUPOLA & FORGE BLOWERS



All Sizes
and Styles,
for Every
Possible Duty.

The Most
Positive,
Durable and
Economical
Made, and

**GUARANTEED TO GIVE
PERFECT SATISFACTION**

**BUFFALO FORGE COMPANY,
BUFFALO, N. Y.**

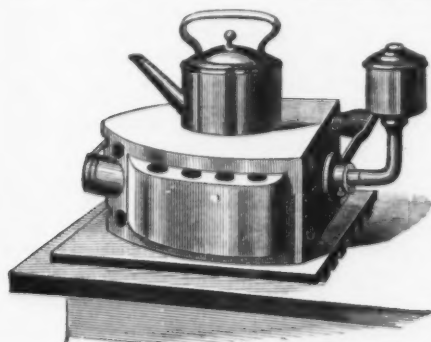


**PENFIELD BLOCK CO.,
Lockport, N. Y.,**

Are sole manufacturers of the
GIANT CAR PUSHER. Have
you a private switch, and, if so,
try one.

FOX SAD-IRON CO.,
78 MAIDEN LANE,
NEW YORK.

Awarded the only *Gold Medal* at the *New Orleans Exposition* over all
Sad Iron competitors.



**Our Iron does away with Hot
Kitchens.**

Being reversible, one Iron does the work
of an entire set (one side heats while the
other is in use). It combines first-class
Fluter and Polisher, also makes the best
little Cooking Stove for a sick-room, &c.,
ever invented. Can be used with either
Gas or Alcohol. Very simple and abso-
lutely safe in handling.

HERO FRUIT JAR COMPANY,

— MANUFACTURERS OF —
Chace's Machine, Sewing Machine, Paragon, Engineers', Drip-
ping and Bicycle

OILERS,

Oil Spouts, Sprinkler Heads, Engineers' Sets, Can, Coffee and Bottle,
Flask and *Shipping Can Screws*, and all other Regular and
Special Goods in *Spun or Stamped Ware*.

All kinds of **SHEET METAL GOODS** made to order.

We have the largest and best facilities for furnishing
the best quality of work and promptly.

Correspondence solicited. Write for Catalogue.

Office and Factories: **GAUL and ADAMS STS., PHILADELPHIA.**

COVERT MANUFACTURING CO.



BUY SNAPS, CHAINS AND ROPE GOODS

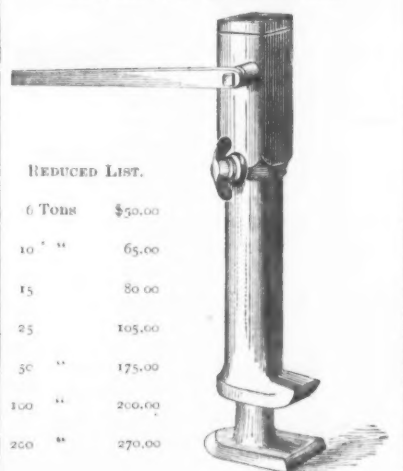
BEARING THE ABOVE TRADE MARK.

They cannot be equalled in price and quality. Are standard the world over.
For sale by all leading Jobbers at factory prices.
Send for illustrated Catalogue and Price List.

**Covert Manufacturing Co.,
WEST TROY, N. Y.**

TANGY'S PATENT Hydraulic Lifting Jacks.

Cheapest Jack in the Market.



REDUCED LIST.

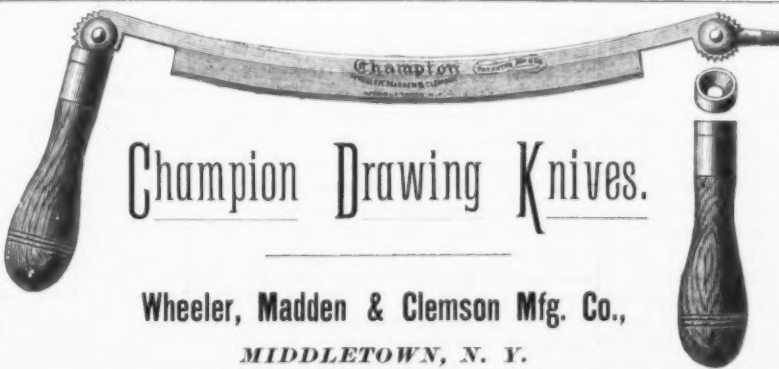
6 TONS	\$50.00
10 "	65.00
15 "	80.00
25 "	105.00
30 "	175.00
100 "	200.00
200 "	270.00

Send for list of other sizes and discounts. Makers
of Hydraulic Punching Presses, Girder Testers, Rail
Benders, &c.

**McCOY & SANDERS,
26 Warren Street, N. Y.**

**ALFRED F. BRAINERD,
Analytical Chemist & Mining Engineer,
BIRMINGHAM, ALA.**

**SOLID
STEEL
BLADES.**



**Adjustable
HANDLES.**

**Wheeler, Madden & Clemson Mfg. Co.,
MIDDLETOWN, N. Y.**

**VIRGINIA NAIL AND IRON WORKS COMPANY,
LYNCHBURGH VIRGINIA.**

NAILS and Bar Iron of Superior Finish, made exclusively from Pig Iron.

PATENTED ARTICLES OF
MALLEABLE IRON,
Hammer's M. I. Hanging Lamps.



For Sale by all the principal Hardware Dealers.
Send for price list.

**HAMMER & CO.,
Branford, Conn.**



**WM. MANN, JR.,
& CO.,
LEWISTOWN, PA.,**

Manufacturers of
**RED WARRIOR
AXES,
BROAD AXES,
Adzes,
Broad Hatchets,
Spanish Axes
and Tools.**

**OHIO CLIP WORKS,
Westville, Ohio,**

Sole Manufacturers of the
"BAKER" CLIP,
For Singletrees, Heavy Axes etc. "Baker" Lap
Jaws, "Baker" Oval Lap Rings, Ferrules and Hooks,
Neck Yoke Irons, etc. Best Goods Made. Ask for them
where you buy your Hardware, or send for Prices &c

**The T. H. Bullock
BELLOWS FORGES**
Cleveland, Ohio.

**MERIDEN MALLEABLE IRON CO.,
MERIDEN, CONN.,**
Manufacturers of a Full Line of the Latest Improved
Patent Adjustable Iron Planes.

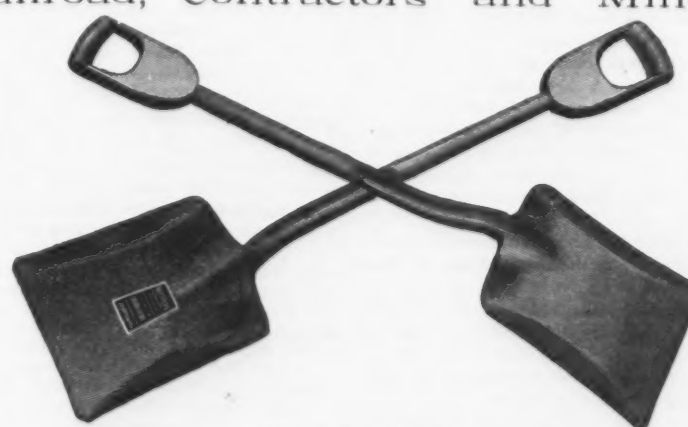
THE BEST NOW IN THE MARKET.
Send for Full Descriptive Catalogue.
New York Office, 37 Barclay St. Boston Office, 147 Franklin St.

**WOOD ENGRAVING
ELECTROTYPING
PRINTED SUPPLIES**
Manufacturers.
Wood Engraving,
Electrotyping
and Printing.
Publisher of The Manufacturers' Exchange.
A. MUGFORD, Hartford, Conn.

**NEWSPAPER
ADVERTISING**
A book of 100 pages. The
best book for an advertiser
to consult, be he experi-
enced or otherwise. It con-
tains lists of newspapers
and estimates of the cost
of advertising. The adver-
tiser who wants to spend one dollar finds in it the in-
formation he requires, while for him who will invest
one hundred thousand dollars in advertising a scheme
is indicated which will meet his every requirement,
or can be made to do so by slight changes easily ar-
rived at by correspondence. One hundred and fifty
three editions have been issued. Sent postpaid, to
any address for 10 cents. Apply to GEO. F. ROWELL
& CO., NEWSPAPER ADVERTISING BUREAU, 10
Spruce St. (Printing House Sq.), New York.

**HUSSEY, BINNS & CO., LIMITED,
Pittsburgh, Pa.,**

Make a specialty of
Railroad, Contractors' and Miners'



Also a full line of
SHOVELS, SPADES and SCOOPS
for the
HARDWARE TRADE.

**COMMON SENSE POST HOLE DIGGERS,
COLD CHISELS, PUNCHES,
WOOD,
COAL
and
STONE } WEDGES.**

Prices quoted on application.

**J. C. McCARTY & CO., Direct Representatives,
97 CHAMBERS ST., NEW YORK.**

British Iron and Metal Markets.

Nails, kegs...	45	125		
Hdw., cs.....	106	1,897	Iron, pkgs....	7 31
Nails, ca.....	3	57	Tacks, cs.....	7 52
Clocks, pkgs..	14	272	Nails, kegs....	9 28
Pumps, pkgs.	10	278	Mach'y, pkgs. 108	300
Mach'y, pkgs.	4	182	Hdw., ca.....	3 36
Ag. imp, pkgs	17	924	Mf. iron, pkgs	6 63

NOTICE.

The stock market was active and strong until reaction set in near the close, the result of selling by the bull pools, but to-day there was recovery. On Thursday sales to realize caused much irregularity, but some of the specialties brought the highest prices next!" Gold shipments from New York are without significance.

The imports of merchandise at the port of New York during the week were \$632,000 below those of the previous week, the total being \$7,226,102, making the aggre-

Large Buyers of Shafting are requested to send specification for special prices.
MERWIN McKAIG,
Cumberland, Md.

Trade Report.

New York.

American Pig.—The market has been quiet, with very little current business doing on standard brands, and the majority of sellers expect to do little for the balance of the current month. No. 1 Foundry continues in restricted supply, and it is likely that, as usual in the summer months, the proportion made will be less than the average. We hear of a number of sales of round lots of Southern Iron for fall delivery at different points throughout the State and New England. We quote for standard brands, tidewater delivery, \$18 @ \$18.50 for No. 1 X Foundry, \$17 @ \$17.50 for No. 2 X Foundry, and \$16 @ \$16.50 for Gray Forge, with the market in buyers' favor. Outside brands are 50¢ below these quotations.

Scotch Pig.—There is absolutely nothing that is new to report. We quote nominally as follows for small lots: Coltness, \$19.75 @ \$20 to arrive; Gartsherrie, \$19 @ \$19.25 to arrive; Shotts and Langloan, \$19.50 @ \$20 to arrive; Carnbroe and Glengarnock, \$18.50 @ \$19 to arrive; Summerlee, \$19.50 @ \$19.75 to arrive; Dalmellington, \$18.50 @ \$18.75 to arrive; Eglington, \$17.50 @ \$18 to arrive, and Clyde, \$18 @ \$18.50 to arrive.

Bessemer Pig.—The market is very dull and quiet, both for Foreign, which is too high for business, at \$18.75 @ \$19 for Ordinary Bessemer, and for Domestic, which is quoted \$18 @ \$18.50 at furnace.

Spiegeleisen.—Not a single transaction is reported. We quote nominally 20% English \$25.25 @ \$25.50.

Bar Iron.—A slightly better feeling is reported, which evidences itself in greater promptness in purchasing as soon as tempting concessions are made. The differences between the men and the employers in the Philadelphia mills are being discussed, and it is expected that some decision will be formulated this week. We continue to quote for delivery here in round lots: Common Iron, 1.65¢ @ 1.70¢; Medium, 1.70¢ @ 1.75¢; and Refined Iron, 1.75¢ @ 1.9¢. Store prices are 1.75¢ @ 1.80¢ for Common, 1.85¢ @ 1.90¢ for Medium, and 1.9¢ @ 2.2¢ for Refined.

Structural Iron and Steel.—There is a little better feeling, a number of large contracts for new buildings being expected to come up at an early date. Among them is that of the Adams Express Co. We quote for Angles 2¢ @ 2.10¢, delivered, and Tees at 2.40¢ @ 2.45¢, for round lots. Steel Angles are quoted 2.35¢ @ 2.45¢, according to quality. Store quotations remain 2.25¢ @ 2.4¢ for Angles, and 2.6¢ @ 2.7¢ for Tees. American Beams and Channels are nominally 3¢ base from dock for all orders.

Plates.—The market is quiet. We quote for round lots: Common or Tank, 2.12½¢ @ 2.20¢; Refined, 2¼¢ @ 2½¢; Shell, 2.4¢ @ 2½¢; Flange, 3.4¢ @ 3½¢; Extra Flange, 4¢ @ 4½¢. For small lots of Steel Plates the quotations are as follows: Tank, 2.70¢ @ 2.75¢; Ship, 3¢; Shell, 3¼¢; Flange, 3½¢, and Fire-Box, 4¢ @ 4½¢, on dock.

Merchant Steel.—We quote nominally for the range from ordinary to good grades as follows: American Tool Steels, 7½¢ @ 9¢; Tool Steel of special grades and finer qualities, 12¢ @ 20¢; English Tool, 13¢ @ 15½¢; common grades, 7¢ @ 9¢; Crucible Machinery, 4.5¢ @ 6¢; Round and Flat Spring, 2.4¢ @ 2.6¢; Round-Edge Tire, 2.4¢ @ 2.6¢; Square-Edge Tire, 2.75¢ @ 2.9¢; Toe Calk, 2.7¢; Sleigh Shoe, 2.6¢ @ 2.8¢; Open-Hearth Machinery, 2.5¢ @ 2.8¢, and Bessemer Machinery, 2.25¢ @ 2.5¢, with freight allowance.

Steel Wire Rods.—Only a small current business is being done, contracts for full delivery not having been placed as yet. We quote \$38 @ \$39 for Ordinary Rods. Foreign Rod Billets, 4 x 4 inches, are nominally quoted \$28.50.

Steel Rails.—We are reported sales aggregating about 9000 tons during the week. Not a single Eastern mill can make deliveries in July and August, and those who must have Rails in that time may be forced to go abroad. There is considerable inquiry for fall and winter work, for which we quote \$34 @ \$35 at Eastern mills. Foreign Rails are quoted \$37 @ \$37.50 at tidewater. There are rumors of sales, which, however, we cannot trace to any reliable source.

Old Rails.—We hear of a sale of 500 tons at a point in Eastern Pennsylvania. In this market there are only few lots available, both Foreign in store and American Old Rails being held above buyers' views. We quote, nominally, \$18.50 @ \$19. There are some indications of speculative inquiry.

Old Wheels.—There has been some business. We quote \$15 @ \$16, the latter for best makes.

Scrap.—The market is very dull. We quote \$18 @ \$18.50 from yard for No. 1 Wrought.

Rail Fastenings.—There is considerable activity in Spikes, and for particularly desirable business prices are shaded. We quote 2.40¢, delivered, for Spikes, and 1.80¢ @ 2¢ for Angle Fish Bars. The latter are now being made of Steel by the Pennsylvania Steel Co., of Steelton, Pa.

Philadelphia.

Office of The Iron Age, 220 South Fourth St., PHILADELPHIA, June 23, 1886.

Pig Iron.—There is very little disposition to do business, and, although the general tone shows improvement, it does not manifest itself to any extent in Pig Iron. The shutting down of many of the mills for a more or less extended period during next month has a tendency to check the demand, and needy sellers are already beginning to show anxiety in regard to deliveries in the near future. The leading companies are in a perfectly easy condition, however, and have really more trouble to supply the demand than to find buyers. Under these conditions the best informed men in the trade are of opinion that June and July will show the lowest prices of the year, and that those who can get the right kind of Iron within the next 30 days will have cause to congratulate themselves before the season is over. This statement is based on the expressed opinions of many leading houses, and, while we find it difficult to satisfy a very close inquiry as to the why and wherefore, it generally happens that in the long run the majority are right. As an encouraging feature it may be said that many of the leading manufacturing establishments report a better inquiry and very fair additions to their order-books, and it may be taken for granted that business during the last half of the year will be very much better than the first half has been. The danger most to be apprehended is in the enormously large production, and, although good Irons are taken as quickly as they can be turned out, it remains to be seen what the effect of a largely decreased consumption will be during the next few weeks. In the meantime the market holds its own very fairly. Some brands are weak and "draggy," others are steady and rather scarce, although of one kind or another there is more Iron offered than can be disposed of, a feature which will probably become more pronounced in the near future. Comparing the position with what it was a week ago we should say that the feeling is better on good Irons, but there is no improvement in demand, and as regards inferior grades they are not only dull, but a shade lower, with absolutely no inquiry for large lots. Prices vary according to brand, quantity, terms of payment, time of delivery, &c., there being no fixed prices except in a few special brands; others are subject to such terms as can be mutually agreed upon. No. 1 Foundry, tidewater delivery, may be quoted at from \$18.25 to \$19 for standard, and \$19.50 to \$20 for choice. Southern No. 1, ex ship, \$17 @ \$18.50, according to brand. Gray Forge at tide, \$16 @ \$16.50 for standard Pennsylvania and Virginia Irons, and \$17.75 @ \$18 for choice brands. Southern, ex ship, \$15 @ \$15.50, according to brand. No. 2 Foundry is dull and in large supply at \$17 @ \$17.50 at tide. Red-Short Irons are nominally \$18 at furnace, but offers at less money are said to have been accepted for some of the very best brands.

Foreign Iron.—There is nothing doing in Bessemer, and prices are nominal at \$19 @ \$19.50, c.i.f., according to brand. Spiegeleisen has been sold to the extent of several thousand tons at about \$21 for 10 @ 12%, with \$25 asked for 20%.

Blooms.—Steel Blooms are quite active several thousand tons having been placed during the week within the range of our quotations, say: Slabs for Nail Plate, \$29 @ \$30 at tide for Foreign and \$30 at mill for Domestic, and from that to \$35 for higher qualities; special grades for Boiler Plates and other uses requiring high tensile strength, \$34 @ \$36. Other Blooms as follows: Charcoal, \$52 @ \$54; Run-out Anthracite, \$43 @ \$44; Scrap Blooms, \$33 @ \$34, and Ore Blooms, \$34 @ \$35.

Muck Bars.—There is a little more inquiry, and holders are firm at \$28.50 @ \$29 at mill, with a fair amount of business offered at about 50¢ less money.

Bar Iron.—The demand has been very light and prices hard to maintain on such a light business. The only thing that prevents absolute stagnation is the demand for Skelp Iron, for which orders to the extent of many thousand tons have been distributed around, giving many of the mills work to carry them well into August. The question of labor was the subject of a long discussion yesterday at the manufacturers' meeting, but nothing was decided upon either way. The agreement with the men terminates on the 1st of the month, but whether manufacturers will accede to the new schedule as demanded by the men remains to be seen. With the present outlook it seems contrary to reason to increase cost, but there is no telling what a few days may bring forth. Meanwhile selling prices are about as quoted last week, viz.: Best Refined Bars nominally 1.85¢, but 1.8¢ is a general quotation, and less than that in some cases. Good medium qualities of Bars 1.7¢ @ 1.75¢, and Skelp 1.82½¢ @ 1.87½¢, for Grooved, and 1.95¢ @ 2.0¢ for Sheared.

Plate and Tank Iron.—The demand is very light, the amount of business entered during the past two or three weeks being barely sufficient to keep the mills running. There is a little better inquiry, however, and the feeling is rather more cheerful, although it is hard to see why it should be, with so little demand and so much cutting in prices as there has been for some time past. Present quotations are about as follows: Ordinary Plate, 2.05¢ @ 2.1¢; Tank,

2.1¢ @ 2.2¢; Shell, 2.5¢; Flange, 3.5¢; Fire-Box, 4.25¢; Steel Plates, Shell, 3.25¢; Flange, 3.5¢; Fire-Box, 4¢.

Structural Iron.—The market is very quiet, with no demand except for small lots, and nothing looking toward improvement in the immediate future. There is an impression that things will start up again soon, but there are no inquiries that promise much business at the moment. The only contract of importance given out lately is the Market Street Bridge, in this city, but the amount is comparatively small (probably 1500 to 2000 tons), and in such dull times it will hardly be felt. Prices are about as last quoted, viz.: 2¢ @ 2.05¢, delivered, for Angles; 2.1¢ @ 2.2¢ for Bridge Plate; 2.4¢ @ 2.5¢ for Tees, and 3¢ for Beams and Channels.

Sheet Iron.—Demand irregular; some report large orders taken during the week; others say nothing doing. The probability is that special quotations have been made on large lots, as those holding to firm prices are getting nothing beyond the ordinary run of small orders. Prices about as follows:

Best Refined, Nos. 26, 27 and 28, 3½¢
Best Refined, Nos. 18 to 25, 3½¢
Common, ¼¢ less than the above.
Best Bloom Sheets, Nos. 26 to 28, 4¼¢ @ 5¢
Best Bloom Sheets, Nos. 22 to 25, 4¼¢ @ 4½¢
Best Bloom Sheets, Nos. 16 to 21, 3¼¢ @ 4¢
Blue Annealed, 2.6¢ @ 2.70¢
Best Bloom, Galvanized, discount, 50¢
Common, discount, 50¢

Steel Rails.—There is a good deal of inquiry from one source or another, but in spite of that prices have sagged off a little, and, while quoted \$34.50 @ \$35 at mill for fall delivery, concessions have been made on specially desirable orders. The tendency, in fact, is toward slightly lower figures, and it is not unlikely that \$34 has been accepted in one or two recent transactions. There are inquiries for large lots, chiefly for delivery in the Northwest, and it is not unlikely that competition for this business has led to a modification of quotations at some of the Eastern mills. There is no scarcity of business, however, and whatever concessions may have been made was for other reasons than immediate need of work.

Old Rails.—Are about the most difficult things we have to quote. Any one wanting to buy would probably have to pay \$20.50 @ \$21 for spot lots, while any one anxious to sell might not get more than \$19 @ \$19.50. Holders are a great deal firmer, but whether buyers will respond or not remains to be seen.

Scrap Iron.—The market is steadier, and, with a better inquiry, holders ask outside figures, as follows: No. 1 Wrought Scrap, \$18.50 @ \$20; No. 2 do., \$13 @ \$14; Turnings, \$14 @ \$14.50; Old Car Wheels, \$15 @ \$16; Old Steel Rails, \$18.50 @ \$20; Fish Plates, \$23 @ \$24—sales 150 tons at \$23.25; Cast Scrap, \$14 @ \$15; do. Turnings, \$10 @ \$10.50.

Wrought-Iron Pipe.—There is a continued good demand and at firm quotations, with discounts as follows: Lap-Welded Black, 57½¢; Butt-Welded Black, 42½¢; Butt-Welded Galvanized, 32½¢; Lap-Welded Galvanized, 40¢; Boiler Tubes, 52½¢.

Nails.—The market has become much steadier within the past few days, and prices fixed at \$2.10 @ \$2.15 from store, with a very fair demand. Complaints have been made in regard to low quotations from Philadelphia, to which we reply that if makers will keep prices steady the market will be so reported. Prices have varied as much as 25¢ per keg during the past two or three weeks, and, although it is claimed that inferior Nails were sold at the low figures, it was impossible to ignore the fact that Nails were sold at extremely low figures, standard brands included. The market is more settled now, however, and there is a fair probability of prices being maintained at the figures now quoted as a minimum, say \$2.10 @ \$2.15 from store.

Pittsburgh.

Office of The Iron Age, 77 Fourth Avenue, PITTSBURGH, PA., June 22, 1886.

There has been no important change in the general business situation during the past week; there is usually a lull in June, when farmers are busy with their crops and merchants and manufacturers are engaged in taking stock. The outlook warrants the prediction that in most departments of trade there will at least be a fair degree of activity during the last of the present year, although, of course, it will not be what it would have been had not the labor troubles taken place. The crop reports as a rule are favorable, although in some sections vegetation has been limited to a considerable extent by dry weather. No men watch the crop reports closer than manufacturers, and no two interests are more closely allied than the agricultural and manufacturing. The demand for manufactured goods is gauged largely by the crops, and it is not strange therefore that the manufacturer is interested in the welfare of the tiller of the soil, as it is on the latter that he is in large part dependent for a market for his products. The Iron wage-scale, as predicted in our report of last week, has been settled for another year, and all apprehension of a strike is set at rest. The Amalgamated Association very sensibly concluded to renew the scale of the past year, which was accepted by the manufacturers. It may be added in this connection that the striking spirit is not near as common as it was a few weeks ago. The great event of the past week was the coal-bait freshest, with the

shipment of over 10,000,000 bushels of coal to the down river markets. This, in addition to being one of the largest "runs" ever made in June, has thus far been the most successful; only two barges were lost.

Pig Iron.—There has been no important change in the situation during the past week, with the exception of a more cheerful feeling in view of the settlement of the wage-scale. Business continues extremely dull, and as consumers generally take stock about the 1st of July they will make it a point to close this month with as little stock on hand as possible. If there was any prospect of an advance consumers would no doubt be inclined to contract for delivery next month, but as it is they are refusing to buy a ton beyond their immediate wants. However, now that the wage-scale is disposed of, and consumers almost without exception are low in stock, an improved demand is probable, and furnacemen are hopeful of a stiffer market, but the prospect for an advance soon is not very encouraging. Consumers aver that the raw article continues to bring more relatively than the products, and there will first have to be an advance in the price of the latter before they can pay any more for the former. There have been considerable Southern Irons offered here within the past week or two, and, while it is offered considerably below the price asked for Irons made here or near-by, there has been, so far as we can learn, but little of it sold. Some of the Southern Irons are very good, but others are not, and a good many mill owners are not disposed to risk the regulation of their product for the sake of saving 50¢ per ton on Pig Irons; moreover, the best Southern Irons cannot be sold here much under the price of well-known home-made brands. We quote as before:

Neutral Gray Forge, No. 1, \$16.00 @ \$16.25, 4 mos.
Neutral Gray Forge, No. 2, 15.25 @ 15.50, 4 "
All-One Mill, 17.00 @ 17.50, 4 "
White and Mottled, 14.75 @ 15.25, 4 "
No. 1 Foundry, 18.00 @ 18.50, 4 "
No. 2 Foundry, 17.00 @ 17.50, 4 "
Bessemer Iron, 18.50 @ 19.00, 4 "

Muck Bar.—We repeat, in the absence of sales, former quotations, \$27 @ \$27.50, cash. Some of the mills, it appears, are not able to make as much as they require, while others have an excess and have some to sell, and others again can buy cheaper than they can make. There is not much margin for profit at present prices.

We can report a sale of Cold-Blast Charcoal at \$25.50, cash. In regard to Bessemer Iron large blocks are quoted at \$18 @ \$18.25, cash. We hear of a lot of some 600 tons being under negotiation and likely to be closed, but the price is withheld for the present.

Manufactured Iron.—Now that the wage-scale has been settled, orders, which for some weeks past have been coming forward more freely, caused in large part by suspicion of a shut down, will probably be light during the rest of this month. There is reason to believe, however, that business will pick up in July, and that it will be at least fairly active during the remainder of the year; there is no accumulation of stock either in first or second hands, and the reports from the West and South indicate that there will be at least an average demand. Manufacturers would like to obtain better prices, but there will first have to be an improvement in demand. Consumption will have to come up closer to production before an improvement in prices can be realized. We continue to quote first-quality Iron on a basis of 1.65¢ @ 1.70¢ for Bars, 60 days, 2¢ off for cash; poor stock from 1½¢ to 1¢ less than rates quoted.

Nails.—There is no change to note in the situation; trade continues slow, as it usually is this month, but an improvement is looked for next month. Prices are still quoted at \$2 @ \$2.05, net cash. The next monthly meeting of the Western Association takes place in this city, but it is not expected that anything important will be done.

Wrought-Iron Pipe.—There is nothing new or important to note in connection with the Pipe trade. Mills continue very busy, and this is likely to be the case until the advent of winter. At the adjourned meeting of manufacturers in New York nothing was done beyond mere routine business. The next meeting will be held in this city. No change in prices. Discounts on Black Butt-Welded Pipe, in carlots, 45¢; Galvanized do., 35¢; Black Lap-Welded Pipe, in carlots, 60¢; Galvanized do., 42½¢. Less than a carload, discounts are 2½¢ less than rates above quoted. Boiler Tubes, 52½¢; Casing, 45¢ per foot, net; 2-inch Oil-Well Tubing, 13¢; 8-inch Drive Pipe, \$1.30 per foot.

Steel.—Standard brands of Refined Cast Tool Steel, 8¢ @ 9¢ per lb.; Crucible Machinery, 3¼¢ @ 4¢; Boiler Plate, 4¢ @ 4½¢; Open-Hearth Machinery, 2½¢ @ 2¾¢. Steel Bloom Ends, no recent sales; nominal at \$20.50 @ \$21. Crop Ends also nominal at \$21 @ \$21.50. Bessemer Blooms and Billets, \$31 @ \$33.

Old Rails.—Old Iron Rails quoted at \$21 @ \$21.25; the last sale reported was at \$21.25, delivered at mill in Mahoning Valley. Old Steel Rails quoted at \$20 @ \$20.50 for short and \$22 @ \$22.50 for long lengths. The large consumers of Old Iron Rails here are said to be pretty well supplied, hence there is not as much inquiry as there was some time ago.

Steel Rails.—Heavy sections are quoted by the Edgar Thomson Works at \$36, cash, at mill, for fall delivery. Both mills here are said for several months ahead, and are

unable to take orders for immediate delivery, and the same applies to most all other mills in the country.

Railway Track Supplies.—No recent change in prices; demand fair. Spikes, 2.40¢, 30 days, delivered; Splice Bars, 1.65¢ @ 1.75¢; Track Bolts, 2.75¢ with Square and 2.85¢ @ 3¢ with Hexagon Nuts.

Old Material.—The demand continues light, while prices remain unchanged. No. 1 Wrought, \$17.50 @ \$18, net ton; Wrought Turnings, \$13 @ \$14; Old Iron Car Axles, \$23; Cast Borings, \$12, gross; Old Car Wheels, \$16.

Coke.—Blast-furnace Coke unchanged at \$1.50 per ton on cars at ovens.

Chicago.

Office of The Iron Age, 36 and 38 Clark St., Cor. Lake St., CHICAGO, June 21, 1886.

Quiet reigned during the week among the workmen of the West, with one or two trifling exceptions. The business community appears to be regaining confidence, and were it not that harvesting time in this section is at hand and in other sections reaping already begun the improvement in business would be more noticeable. The rains of the early part of last week were timely and general where most needed, and have greatly improved crops that previously looked like failures. This favorable aspect is received by manufacturers and jobbers with pleasure. The benefit is already being felt in some lines of trade. Manufacturers are increasing their product, and jobbers are receiving heavier orders for fall goods. While a probable increase in demand is pretty certain, there is, however, very little room to anticipate higher prices. The signing of the scale by the iron manufacturers virtually dispels the likelihood of a strike and the possibility of higher prices from that cause, but with a steady increase in demand figures now obtained on all lines will likely rule firm and result in a satisfactory year's business.

Hardware.—The volume of trade reported for the week is somewhat less than the week previous, but of a sufficient strength to keep all jobbers quite active. The demand for Wire Cloth has fallen off, but increased somewhat for Screens, Butts, Locks, Window Glass, Carpenters' Tools, Blacksmiths' Tools and Carriage and Wagon Stocks. A slight advance is noticed in the price of Wringers. No other features of importance are mentioned on price lists. It is expected that trade will gradually diminish now until after the summer months have passed. The amount of business done during June far exceeds that of last year, and thus far this year is the largest month jobbers have had. Much of the trade that was deferred during April and May was received during this month, which accounts for the unusual activity.

Barb Wire.—No developments of importance have been wrought in the Barb Wire market during the week. Trade has dropped to about the usual demand for the summer months, and is made up almost entirely of small lots. Jobbers continue the quotation of 3½¢ for Painted Wire and 4½¢ for Galvanized. We are informed that several new signers have been obtained to the "pool" company, but nothing further of importance has been done. Many of the signatures to the agreement are conditional, and, when they come to make the allotments to manufacturers, the prime obstacle to consummation will present itself. It is the opinion of knowing men that it will be impossible to make a satisfactory adjustment of the proportions to be manufactured by the different companies. Several of the most prominent makers in the West have not yet signified their willingness to accept the terms of the agreement.

Nails.—The demand for Nails continues about the same as a week ago. There appears, however, to be more disposition on the part of country merchants to place orders for carload lots. Manufacturers and jobbers are more firm in prices demanded, and sales are consequently no larger. From store jobbers continue the quotation of \$2.10 in small lots for Iron Nails and \$2.25 for Steel Nails. Carload price by manufacturers of Iron Nails, delivered in Chicago, ranges from \$1.95 to \$2.05, and on Steel Nails from \$2.05 to \$2.15. All makers are at variance on prices, but show a tendency to be firm and advance rates. The Western Nail Association held a regular monthly meeting in this city last week. It is said that only about 25 per cent. of the membership was present. After discussing the business outlook it was decided to make no change in the present card price for the next 30 days. The remaining portion of the session was occupied in considering the present attitude of the Nailors' Association. The members of the Western Nail Association claim that it is impossible to accede to the demands of the workmen and successfully compete with the Eastern manufacturers, who pay less wages to their workmen. It was stated that Eastern manufacturers could place their Nails in the Chicago market at a less price than the goods could be manufactured for in the West, and solely because their labor was obtained at cheaper rates. It was also stated that most of the factories were taking steps to introduce Steel Nails, which would do away with the large force of puddlers now employed, and consequently lessen the expense of the manufactures. There were several charges made that members of the association were

cutting under the established rates, but no action was taken in the matter. Wire Nails are quoted at \$3.50 per keg for 10's, with the regular advance for small sizes.

American Pig Iron.—Market quiet, but in making sales it shows an underlying tone which possesses elements of strength and hope for the future. Large manufacturers of every class of goods are looking toward placing orders for such quantities as they will require for the balance of the year. It is yet some weeks in advance of the time when the heaviest buyers place their orders, but the positive quotations they have received upon casual inquiries strengthen the opinion that if any change in prices occurs it will be upward. Lately there is nothing that forebodes weakness on the part of furnacemen, and since they have assumed this bold front and determined to obtain living prices the tide has turned in their favor. The small buyer has been taking more than his usual quantity, and sales for the week have ranged from carloads to 1000 ton lots. Some of these were made at figures slightly in advance of prices that would have been accepted two weeks ago. It appears to be the object of all furnacemen to even up their figures and establish a uniform basis of prices. On carload lots of Lake Superior Charcoal we hear of no quotations at less than \$20, and understand that several brands cannot be had at less than \$20.50, four months. Car-wheel makers, in anticipation of obtaining contracts for a portion of the wheels that will be required for the freight cars that are being let by the different roads, have been taking options on lots of iron to be delivered in the next 30 days, and there is scarcely a furnaceman in this territory but what expects to have more or less demand for this purpose. Coke Irons, all Ore, are, if anything, a trifle stronger, but the quotation of \$19, carload lots, is perhaps bottom to all buyers. Cinder Mixed Irons are quoted at \$18, with a slight increase in demand. There is no change in Ohio Standard Blackbands, and the quotation of \$20.50 on Briar Hill Iron is adhered to, while one other furnace announces their asking figures, \$20, as bottom. On Southern Irons there is no regularity in price. Quotations vary from 50¢ to \$1 per ton, according to buyer and quantity. We repeat the nominal quotation of \$17.50 at \$18 for No. 1 Foundry, \$17 for No. 2, \$16.50 for No. 2½ and \$15.50 for No. 3. While it is said that the feeling among Southern furnaces is decidedly better, it is acknowledged that they have lost all that was gained in price during December and January, and are now only a shade above the ruinous figures that they experienced last August. It is thought that there is no possibility of a further decline, and consumers are looking around further for such lots as they will, in all probability, require for the balance of the year. Thus far, however, there have been no sales of importance made, and strong competition is brought out wherever there is a probable buyer.

Merchant Steel.—There appears to be a little improvement in the demand for Open-Hearth and Bessemer Steels, with prices a shade firmer, but the whole market is very much demoralized and offers no inducements to purchasers. Heavy buyers have not yet offered specifications for bids, and until they do the market is likely to continue in the present condition. No changes in prices previously quoted have been reported.

Steel Rails.—Considerable surprise is expressed by makers in this vicinity regarding contracts which, it is said, were placed with Eastern mills for Western roads. Why these orders should be placed in the East without giving Chicago makers an opportunity to bid is a conundrum. They report no new demand save small lots, which are largely for immediate delivery and frequently from roads with whom they now have contracts. No changes are noted in quotations, which are \$38 for first quality and \$34.50 for seconds.

Bar Iron.—The signing of the scale by the iron manufacturers has apparently cut short the demand for future delivery. Buying is said to be stronger on the best grades of New Puddled Iron, on which we renew the quotations of 1.85¢ rates from store, and 1.75¢ rates from mill. Common iron on card specifications is quoted at 1.60¢ rates, flat, and on merchant orders at 1.55¢ rates from mill. From store jobbers quote 1.75¢ in small lots. There is nothing very encouraging in the general aspect on account of the unsettled condition of prices, though in demand some improvement is looked for within the next six weeks. We hear of several contracts which were placed, covering the next six months' delivery, at figures quoted above.

Structural Iron.—Several good-sized orders for Beams were placed during the week, but the majority of trade consists of small lots. Bridge material was in fair demand, and considerable business of this character in prospect. We hear some complaints regarding low prices that were made on Architectural iron outside of Beams. Upon this basis one can truthfully say that the Beam combination is not cut, but the figures accepted for other material entering into the structure frequently decides who shall obtain the contract to furnish the Beams.

Galvanized Iron.—Some improvement is noted in the demand for Galvanized Iron for cornice-work. Cornicemen, however,

say that their work is all in small jobs, and no large work is now before the trade. Higher prices are reported on a grade of Iron that has heretofore been classed among seconds. The bundle trade from store is said to be improving. Jobbers quote 60 and 10¢ off on Juniata, and 60, to and 5¢ off on Charcoal.

Black Sheets.—Are in better request from country merchants and stove manufacturers. Stove Pipe makers have not been very active, yet it is possible that they have placed some orders quietly. On the best grades of Black Sheet the demand has been fairly good during the past two weeks, and prices are, if anything, a shade firmer than they have been in the last 30 days. We make the following quotations from store: No. 24, 2.80¢; Nos. 25 and 26, 2.90¢ and No. 27, 3¢.

Old Rails.—Prices have stiffened up a little on Old Rails, and \$19 is now quoted as the price for Chicago delivery. The N. C. R. M. Co. are quoting \$19.50, Milwaukee. Some 300 to 500 tons have been offered at \$21, and buyers could be found at about \$17.50 at \$18. Old Steel Rails have been in fair request, particularly in short lengths. Rails are not scarce, but prices asked are higher than buyers are willing to pay.

Old Wheels.—There has been an increased demand for Old Wheels at former prices. Sellers have advanced their figures to \$15.50, cash, as their lowest figure, which is from 50¢ to 75¢ a ton higher than buyers have offered.

Scrap Iron.—There is no change in the condition of the Scrap-Iron market save that the stock accumulating is getting to be burdensome. No. 1 Wrought is quoted by dealers at \$17.50 at \$18, while mills are offering about \$17. Another source of complaint is the numerous gradings that are demanded, which makes it difficult to quote a price that will cover all included under this heading. No. 1 Mill is quoted at \$14, and No. 2 at \$9. No other changes are reported.

Pig Lead.—A sale of 1100 tons Richmond to New York speculators is reported, which has strengthened the market some and made quotations a trifle higher. The market is now said to be tolerably firm at 4.60¢, and sales of 400 tons are announced. The Pig-Lead market is so well in hand that the moment a surplus stock is visible speculators gobble it, and thus maintain prices, which would from circumstances be weak. Manufacturers of Pipe and Sheet Lead have large stocks on hand, and are buying very lightly at present.

Birmingham.

BIRMINGHAM, ALA., June 21, 1886.

The business world has been taking on a summer complexion very perceptibly in the last week. Less activity is noticeable on the streets here, and jobbers report less business throughout this region than there has been in several months. Railroad traffic is the one thing that holds up to its spring volume, and it in a large measure is only making up for the interruption of the first of the month. The promises for the fall are hardly so good, either. An excess of rain in the last few days has materially damaged crops below here. In certain districts the prospects for cotton and corn are said to be as bad as they have been at this season in 20 years. Complaint is not general throughout the State as yet, though, and on the whole fair harvests may reasonably be expected. The industrial atmosphere is full of promise for this city. Its existing enterprises are all busy and new ones are coming constantly. Among the assured accessions are another bridge and bolt concern and a good-sized cotton compress, the buildings for the former being already under way. Notable progress has been made in railroad construction in the last 10 days. Track-laying has begun on the Georgia Pacific's extension westward, and ground has been broken here on the Kansas City, Fort Scott and Gulf Railway Co.'s line from here to Memphis. Forty miles of the latter have been let, and according to all the promises is to be pushed to speedy completion, track going down as fast as the grading will permit. House-building is still one of the most active lines of business here. The most notable item in this connection is the breaking of ground for a hotel that will be one of the finest in the South.

Pig Iron.—Is selling in all directions in small and medium sized lots, and is moving more actively now than foreign cars can come in to supply the deficiency in the equipment of our railroads. There is no such means of relief between the mines and the furnaces, and the managers of some of the latter, along with Coal and Ore operators are embarrassed by scarcity of cars. Stoppage of their Ore supply has compelled the Sloss Furnace Co. to blow out one of their furnaces. The market seems to resist very stubbornly the bullish tendencies apparent from this point of view. Prices remain at the unsatisfactory figures they reached a month ago.

Finished Iron.—The Birmingham Rolling Mills still get business enough to keep their puddling department and Bar and Light Sheet mills running day and night. The slight stiffening of prices noted a week ago is well sustained, too. The foreshadowed continuance of the present scale of wages is satisfactory here both to the employers and to employees.

Machinery.—A good volume of orders for Machinery and for structural specialties has come to the shops in the past few days. The largest item is a hoisting outfit wanted by a leading Ore concern for an increase of production. Several good orders have been received from Southern Georgia and Florida.

Coal.—Is quiet, without perceptible weakening of prices, at material reduction of output.

Yellow-Pine Lumber.—A heavy business is doing in this line with the North, West and Southwest, and the demand is constantly on the increase. Shipments were resumed only a few days ago on the Louisville and Nashville Railroad, which moves the greater part of the product of the State. The change of gauge thus cut off supplies for more than two weeks.

Chattanooga.

Office of The Iron Age, Carter and Ninth Sts., CHATTANOOGA, June 21, 1886.

While general business is dull, as is usual through the South at this time of the year, there seems to be an undercurrent and feeling among the wholesale merchants that the volume of business will soon revive, and many of them are shaping their course accordingly. Their argument is that goods of all lines are very cheap and cannot go lower, while there is a strong probability that there will be a stiffening up before long; that money is plenty, and they propose to lay in stocks sufficient to meet what seems to them will be quite a spirited demand as the fall approaches. There is a tendency, however, among many of the large consumers to go to headquarters to make their purchases. Notwithstanding this, however, many have to buy locally for articles for immediate use. Most of the projected furnaces are assuming such shape in expenditure of money as to give assurance that all of them mean business and will push their enterprises forward as fast as economy would dictate. There can hardly be a doubt that nine furnaces, most of them of the largest capacity, will be completed during the coming year in the Southern district. More are projected, but developments have not yet reached the stage to warrant particular mention.

Pig Iron.—The outlook for this article is certainly brighter than what it was some two or three weeks ago, although we can hardly ascribe it to any particular cause. While probably many reasons could be suggested, the reconciliation of labor in the different industries is no doubt one great reason. Confidence in the continued prosperity of the country seems to have become a firm conviction of most of the business men of the country, and a feeling of confidence exists to a much greater extent than at any time during the year. While prices are low, the many inquiries that are being received among the producers and brokers would indicate that the prospective consumption will cause prices to go higher. The furnaces in the Southern district could to-day place their entire output for the next six months at prices that are now ruling. Some are placing large orders, but the policy of selling at such figures is questioned by many who are holding off for higher figures. Freights to Northern and Western points have been reduced considerably, while to Eastern points they remain the same.

Coal and Coke.—Coke still remains a serious obstacle in the full development of the furnace output, and many a temporary bank is the consequence. Nearly all the mines, however, are doing their best to remedy the scarcity as fast as possible, but still the supply is short. As a consequence of this condition of things many a bushel of what is called Coke goes into the furnace, and the result is an inferior grade of Iron.

Miscellaneous.—We have to note the location of new powder works near this city. They are called the Dixie Powder Co., and will manufacture dynamite only. They commence manufacturing the present week with a capacity of 2000 pounds per day. The demand for this kind of explosive has increased very much of late through the South, and the parties say they have already enough orders on their books to keep them going for several months. Quite an interesting feature of the results of the change of the gauge of the railroads in the South is the number of cars that come to us from the North with initials of roads that were heretofore unknown to us. Cars from Maine, Vermont, and, in fact, from every State in the North, can be seen almost daily passing through our town, destined for points South.

Cincinnati.

JUNE 21, 1886.

Pig Iron.—Dealers report an exceedingly dull market. Consumers are covering up preparatory to taking account of stock in July. Prices ruled in buyers' favor during the past week. Some lower grades of Foundry have fallen in price 50¢ at \$1 per ton. Quotations for the past week:

Charcoal Foundry.	
Hanging Rock, Best, No. 1, 4 mos.	\$21.00 @ \$21.50
Hanging Rock, Good, No. 1, 4 mos.	20.00 @ 20.50
Hanging Rock, No. 2, 4 mos.	18.50 @ 19.00
Southern No. 1, 4 mos.	18.00 @ 18.50
Southern No. 2, 4 mos.	17.50 @ 18.00
Coke Foundry.	
Ohio and West Pennsylvania, No. 1, 4 mos.	18.00 @ 18.50
Ohio and West Pennsylvania, No. 2, 4 mos.	17.00 @ 17.50
Southern—Virginia, Tennessee, Alabama and Georgia, No. 1, 4 mos.	17.00 @ 17.50
Southern—Virginia, Tennessee, Alabama and Georgia, No. 2, 4 mos.	16.00 @ 16.50
Close Foundry and Mill grades.	14.50 @ 15.50

Silver-Gray Softeners.	
Ohio Stonecoal, No. 1, 4 mos.	17.50 @ 18.50
Ohio Stonecoal, No. 2, 4 mos.	16.50 @ 17.50
Ohio Stonecoal, No. 3, 4 mos.	15.00 @ 16.00
Car-Wheel.	
Southern Warm-Blast Char-L. cash	17.50 @ 18.00
Southern Standard Warm-Blast Charcoal, 4 mos.	23.00 @ 25.00
Hanging Rock, Warm-Blast Charcoal, 4 mos.	19.00 @ 20.00
Hanging Rock, Cold-Blast Charcoal, 4 mos.	23.00 @ 25.00
Southern Cold-Blast Charcoal, 4 mos.	21.50 @ 23.00
Maryland and Virginia	27.00 @ 29.00
Forge.	
Southern Coke, Neutral, 4 mos.	15.00 @ 15.50
Southern Coke, Cold Short, 4 mos.	14.00 @ 14.50
Southern Coke, low grades, 4 mos.	13.50 @ 14.00
Other makes, various grades	15.00 @ 17.00
Scrap.	
Rails.	20.00 @ 20.50
Wheels.	16.50 @ 17.00
Wrought, for range of grades, per 100 lb.	50 @ 85
Cast, for range of grades, per 100 lb.	30 @ 65

Customary discount 40 at 50¢ per ton for cash from time prices. The above quotations are f.o.b. here, or less the freight to Cincinnati when orders are filled at furnaces.

Louisville.

W. B. BELKNAP & CO., Louisville, write as follows, under date of June 21: While there is nothing to be elated over in the present business situation, neither are there any special grounds for discouragement. Trade is growing a little greater in volume as we approach July, and in some articles prices are inclined to harden. The renewal of the Iron scale for the coming year by the Amalgamated Association, at last year's figures, while it deprives the market of any unusual stimulus, at the same time cannot ultimately fail to improve it. Up to now manufacturers were afraid to make prices except at such figures as failed to interest buyers. Now there is a certainty to go on, as this difficulty is out of the way, and buyers will feel more confident that figures taken are nearer to a true expression of value than if the doubtful labor question were not solved. We think, moreover, that the influence of this decision upon the whole country must be beneficial. That a large body such as the association represents should sit in convention a couple of weeks, and examine into matters very thoroughly and then report that there was nothing apparent to justify an advance, must be a convincing argument against disturbances to those in other branches as well.

Bar Iron.—Seems to be in plentiful supply. Many of the mills are soliciting orders for guide-mill sizes and seem to be somewhat overstocked. Bass sizes are well upheld.

Sheet.—There is no change to note except that Sheet Iron is being much more largely used than before. The various forms of Corrugated and V Crimp are daily becoming more popular.

Nails.—Within the past week Nails seem to have gathered a little strength. The extremely low quotations which were made by some of the manufacturers of Iron Nails have been withdrawn, and the inquiries for Steel Nails particularly have become much more numerous than of late. There seems to be no special deficiency in the supply, but only a good demand for current wants. This market was likely to have been affected by low water but for the timely rains, which make it possible for the Wheeling and Pittsburgh packets to run again.

Wire.—No amount of promises of pools, syndicates and royalties seem to have been able to uphold the Barb-Wire market. Prices have steadily weakened since the early spring, and have, we fancy, touched as low a price as ever known in the history of the article. As is usual, the interesting thing is to know where the stopping place is.

GEORGE H. HULL & CO., of Louisville, report to us as follows, under date of June 22: The market for Pig Iron has been very unsettled and irregular during the last week. Some large sales of choice brands have been made at full outside figures, and there have been some indications of a firmness that has been absent for some little time. On the other hand some large sales of irregular and mixed grades have been made by Eureka, Woodward and Dayton furnaces, on private terms and at very low prices—supposed to be in the neighborhood of \$13. The low sales made have had a depressing influence in this immediate vicinity. It is likely, however, that the low sales were made of Silver Gray and Bright Irons to clear up yards, and probably will not influence prices on regular grades. Inquiries for Iron from interior points are more numerous, with some indication of an improvement in prices in the near future. We quote for cash as below:

Pig Iron.	
Southern Coke, No. 1 Foundry.	\$16.50 @ \$17.50
No. 2 "	15.50 @ 16.50
No. 2½ "	15.00 @ 16.00
Hanging Rock Coke, No. 1 Foundry.	16.50 @ 17.00
Hanging Rock Charcoal, No. 1 Foundry.	18.00 @ 19.00
Southern Charcoal, No. 1 Foundry.	17.50 @ 18.50
Silver Gray, different grades.	14.00 @ 15.00
Southern Coke, No. 1 Mill, Neutral	14.50 @ 15.00
" " " " " " " "	13.50 @ 14.00
" " " " " " " "	14.00 @ 14.50
" " " " " " " "	17.00 @ 17.50
White and Mottled, different grades	12.00 @ 13.00
Southern Car-Wheel, standard brands.	24.00 @ 25.00
Southern Car-Wheel, other brands	20.00 @ 21.00
Hanging Rock, Cold-Blast.	24.00 @ 25.00
" " " " " " " "	30.00 @ 31.00

Old Material.—The market for Old Material is quiet, and no change in price. Old Wheels, that were quite plenty two weeks ago, are now scarce and no lots offered. We quote for cash as below:

Rails, per ton.	\$20.00 @ \$20.50
Wheels, per ton.	14.00 @ 14.50
No. 1 Wrought, per 100.	85 @ 95
No. 1 Country Wrought, per 100.	70 @ 80
No. 2 Country Wrought, per 100.	50 @ 60
No. 1 Cast, per 100.	45 @ 55
Boilers, cut, per 100.	60 @ 65
Boilers, uncut, per 100.	40 @ 50
Flues, Tanks and Sheets, per 100.	25 @ 35
Axles, per 100 lb.	90 @ 1.00

St. Louis.

ROGERS, BROWN & CO., St. Louis, W. H. SHIELDS, manager, report, under date of June 21: A much better feeling prevails, and the indications are that considerable

Iron will change hands within the next 60 days. Prices for immediate delivery are not very strong, but we have heard of some furnaces refusing orders at the present prices for future delivery. There is considerable figuring going on, but sales of any consequence for the past week have been few and far between. We quote:

Charcoal Foundry.	
Missouri.	\$17.00 @ \$18.50
Southern.	17.50 @ 18.50
Coke and Coke Foundry.	
Southern, No. 1.	18.00 @ 18.50
Southern, No. 2.	17.00 @ 17.50
Ohio Softeners.	17.00 @ 20.00
Mill Iron.	
Missouri.	16.00 @ 16.50
Southern.	15.00 @ 16.00
Car-Wheel and Mottled Irons.	
Southern.	20.00 @ 25.00
Lake Superior.	21.00 @ 23.00
Scrap, etc.	
Old Wheels.	15.00 @ 16.00
Cornellville Coke (Frick's).	5.65

Detroit.

CHARLES HIMROD & CO., dealers in Pig Iron, Detroit, Mich., report, under date of June 21, as follows: It is with some satisfaction that we can note the continuance of good demand at fair market rates for the past week. Judging from market reports elsewhere this seems to be the general rule throughout the country, and leads us to believe that, notwithstanding the large quantity of iron that is being made, there is a place to put it all. That there should be an advance, or that if such an advance should take place it would be much higher, is a question that the next few months will solve. It looks, however, as though the taste of good times which the Pig Iron manufacturers had during the early part of the year had produced a lasting effect, the long period of depression and actual loss in business being then supplanted, temporarily at least, by a prosperous time, and they are very loth to relinquish the idea that this time is past. Although the active demand, commencing the latter part of last month, has been very steady, it has not effected anything except a firm feeling in prices. Pig-Iron statistics show that there is not a very great accumulation of iron, still there must be a steady and large demand to sap up all of the iron that is being made, and we trust that the hopeful ones are not oversanguine in stating that this is coming during the present year. Southern Irons show more weakness than any other grades, and Lake Superior Charcoals lead in firmness, followed by Bessemer and Northern Coke Iron. We know of one offer having been made for a round lot of Old Car-Wheels at 50¢ higher than our last report, which was not accepted. Outside buyers are inquiring prices, we presume in a speculative way, and seem quite ready to take hold should present anticipations approach a little nearer confirmation. The market is fairly quotable to day as follows:

Lake Superior Charcoal, all numbers.	\$22.00 @ \$22.50
Lake Superior Coke, all Ore.	20.25 @ 21.00
Lake Superior Coke, Cinder Mixed.	19.00 @ 20.00
Standard Ohio Blackband.	20.25 @ 21.00
Southern No. 1.	17.00 @ 17.50
Southern Silvery, Open.	17.00 @ 17.50
Southern Silvery, Close.	16.50 @ 17.00
Jackson County, Ohio Silvery.	18.50 @ 19.00
American Old Iron Rails.	20.00 @ 22.00
Old Wheels.	17.00 @ 17.50

Coal Market.

The Coal market is dull and weak, with little prospect of more strength for a month to come. Shipments are almost exclusively on former orders. The dullness in Anthracite is partly due to the renewal of mining in the Bituminous regions, manufacturers to some extent availing themselves of the change. Domestic sizes continue to accumulate, but not excessively. The Lehigh Navigation Co. claim to be an exception, that they have been compelled to exceed the quota for June under the official allotment, but most of the companies will put a check on production before the close of the month. The common impression is that there will be no advance in either tolls or prices for the coming month.

The official report of tonnage for May shows an output of 2,253,639 tons, with a total of 11,931,057 tons this year to June 1, as against 10,211,290 tons in five months last year. The stock on hand June 1 was only 614,451 tons. The allotment for July is 2,500,000 tons. Prices of Anthracite as a rule are shaded below the circulars 20¢ at 30¢ per ton, but the concessions in most cases are by individuals rather than companies. Bituminous Coal is quoted about \$3.25.

Lovegrove & Co., 152 North Third street, Philadelphia, have introduced a new style of wrought-iron grate-bars for vertical boilers. This grate consists of a cast-iron ring which is in two parts, so as to place in the boiler without removing from base. It has projections for holding the bars and forming the air space. The bars are made of refined wrought iron, can be removed and straightened should they warp; a single bar or any number can be replaced by new. Taken altogether it is believed to be complete as well as economical.

The Dingley Shipping bill was signed by the President, with the understanding that a supplemental bill will be recommended making it clear that all expenses attending its practical working shall be paid from the Treasury.

It is reported that the River Euphrates bids fair to disappear altogether in the spreading marshes just below Babylon, which have ruined the steamboat channel and are now obliterating navigation for rowboats.

Tatum & Bowen, dealers in oils and machinery, were among the occupants of Thompson's building, burned in San Francisco on the 20th inst. Reported loss, \$120,000; insurance, \$75,000.

make a sea voyage for a certain class of grinding, it is also true I have seen others ground within two miles of the Cutlers' Hall, and beautifully marked "Ground in Hamburg." I think it no service to my native town to shirk the fact that the greatest danger to her trade is from the striking advance of legitimate foreign competition, and that her most dangerous and veritable enemies are, and have been, those of her own household, so to speak.

Some time ago your correspondent "Trinchante" wrote much with which I cordially agree on this point. I do not go with him in believing that Sheffield would have prospered by resolutely declining all cheap grades; e. g., I fear it will be near the millennium before the bulk of consumers will learn to appreciate a rough-looking, but perfectly-cutting, one blade knife, such as can be profitably retailed for sixpence, to a non-cutting flyed, but polished, two-blade, at the same price. But in the formerly imperfect "goffing," instead of honest hammer and anvil, for saws; in the use of incapable machines, instead of the dexterous hand and wrist of the file-cutters; in the largely developed production of flyed, steam-hammered, &c., blades, for even good knives, instead of the old hand-forged, are to be found the true causes of much lost Sheffield prestige of once famous brands.

So far as Cutlery is concerned, however, I still think much of the best Sheffield make justly maintains its prestige, and for the second-class and inferior grades a little more regard to finish would at present prices recover some trade now taken by Germany, very often with no lower prices or better intrinsic quality, but merely from pleasing the buyer's eye. I regret I can offer but scant consolation to those who lament the palmy days of Sheffield's unchallenged supremacy all along the line. It is sometimes forgotten that workers in steel and iron, particularly of Cutlery and Tools, were three centuries ago far more numerous and advanced in various Continental centers than in England, and in these days of easy travel and communication it is inevitable that the tide of business should partially flow once again to the cities whence it formerly ebbed. The present greater attention to customers' fancies and the lower profits of masters, with better discipline and less wages of the men, will do no more than keep Sheffield well to the front—and by no means always first—in the various races for such honor and wealth as the Hardware trade may still afford. The reduced prices and acceptance of machinery and new processes are 20 or 30 years too late to again place Sheffield a distance before all rivals. In many lines 15/ per week would not now retrieve a trade that a generation ago could have been retained by content and honest work at 25/ wage.

Cutlery Manufacture at Solingen, Germany.

A correspondent of the London *Ironmonger* writes to that newspaper as follows:

Solingen cutlery has enjoyed a reputation in Germany and in many parts of the Continent for an indefinite period; but until a comparatively recent date the great bulk of the make has been in the lower grades of quality and in "get up" and finish. To this fact may no doubt be largely attributed the prejudice which exists against German cutlery—a prejudice which has blinded the eyes of English cutlery-makers to the improvements which have taken place within the last 20 years or thereabouts in nearly, if not every, department of a number of German cutlery works. It is old history to refer to the "strike" period which disturbed the trade of Sheffield to such an extent that orders were sent to Germany to be executed as best they could (patterns being, of course, also sent) to meet the exigencies of business; and how, too, the German makers "read, marked and inwardly digested" the full opportunity thus presented to them of improving their patterns and their modes of manufacture. Yet from the time of that incident in Sheffield's career the makers of Solingen have been slowly but steadily advancing, until now it is quite clear they are, on more grounds than one, enabled to meet many Sheffield makers in the open market. The competition of the Germans in the Austrian markets, in North and South America and in other countries has also been familiarized, and the question has from time to time been vigorously discussed. How to meet that competition is a question of the hour, especially if it is granted that a superlative quality is not the one prime consideration it was some 20 years ago. The whole conditions and requirements of trade are being revolutionized, and the market does not ask for goods that will last a century, but such that, being of sufficiently good quality, will last a reasonable time. To solve this problem not a few of the German makers have practically considered their foreign markets, by visiting them and by studying the commercial systems, and also the languages spoken, and if, as one result, they have found it desirable to improve the quality of materials used for certain of their wares, they have made the improvement, and added a style of finish and attractive design which will bear a close inspection.

To this full appreciation of the markets must also be coupled the methods of manufacture. Of the lower grades and of stamping or "flyed" out blades from sheet steel no criticism is here intended. Such blades occupy a position in the market which may well be left alone; but, as will be seen in subsequent paragraphs, the methods of producing qualities and kinds which are intended to compete on equal grounds with Sheffield's good work are such as to account for the position the German makers have secured. There are, of course, the important questions of rates of wages and hours of labor; but, as it is well known that the rates and hours that prevail in Germany and those in England are very different, and as they involve considerations which in this place it is not desirable to canvass, attention will be confined to manufacturing details, supplemented by the hours of labor and rates of pay.

In Solingen and the district round there are about 600 makers of cutlery, but by far the greater number of them are small men,

ranking with the "little mester" of Sheffield, and, as the principle of subdivision of labor is extensively adopted, much of the work is done in little shops. Among the large and more important makers are the firms of Gottlieb, Hemmesfahr, Hendrichs & Grah, Albert Röttgen, Daniel Peres, H. Böcker and J. A. Henckels. This last named is the largest and in every respect the most prominent firm, and was the subject of some ridicule in the columns of a leading London daily journal at the time the discussion was proceeding on the defective swords and bayonets discovered in our army. The name of the firm was not mentioned, but the trademark was, that trade-mark being a pair of skeletons joined at the arms and legs after the manner of the Siamese twins. The allegation against the firm's make was that knives of a most inferior character bearing the mark are found in many of the hotels and restaurants of the Continent. To this Mr. Albert Henckels, the works-managing partner of the firm, made reply to the writer: "We make a class of knife to suit hotel keepers, because they will not buy good ones, as they lose so many in the course of a year. But this is not peculiar to us, as I know from my acquaintance with Sheffield, where I lived for a year, that the class of trade is specially catered for. I shall be very happy to show you round our works, and you will then be able to judge for yourself." On the score of importance and size it will perhaps suffice to state that the firm make all their own steel for manufacturing purposes. This example is not copied, it is believed, by any other cutlery firm either in Solingen or elsewhere in Germany. A shop is also kept for the repairing of the tools and machines generally, and for making certain kinds.

Swedish pig and Swedish spiegel is used, and not the "Swedish" brands made in Germany, of which brands much has been heard of late years. For refined steel Steyermark steel is used. There are two furnaces in the steel-making department, and two Siemens generators for making gas with which the furnaces are fed. One furnace is built for 16 pots, and the other furnace for 10 pots. Five castings are made in the course of 24 hours, and the ingots are generally of a size to take two pots. Some ingots, however, require three pots, while on the other hand one pot is sufficient for some kinds. The fuel used in these furnaces is obtained from collieries some 40 miles distant. The firm make all their own pots at the rate of about 200 per day. This quantity is turned out by the use of a double pot-making machine worked by power and two men. For treating and burning the clay five stoves are employed, while for grinding the material a powerful grinding mill is worked. The output of pots is required for use in the works, none being sold to the trade. In addition to the daily make, the firm, it was stated, always carry a stock of about 10,000 pots, so as to allow of the requisite seasoning.

For hammering the ingots into bars there are three steam hammers, the largest of about 15 cwt., but in this process there is nothing special calling for remark.

A great feature of these works is that every blade, whether for table knives, pocket knives, scissors or razors, is forged under steam hammers. For table blades about 12 operations are necessary, commencing from the little ingot-like pieces of metal; and for scissors from 6 to 12 operations, according to design and the special quality. Under this style of working there is no welding of the tang and bolster on to the steel blade in the case of a table knife, the whole blade being made from one piece of steel. The *modus operandi* is, taken altogether, as follows: The bars are cut into certain lengths, and from these lengths the little pieces, which are about 1½ inches long, are stamped out under a hammer which works very quickly and can be operated by a boy and a man, the boy working the hammer while the man feeds it. Of these hammers there are now two types in use, the more modern of which is the invention of Mr. Albert Henckels. At the present time there are only a few of these at work, but it is intended to put others down, and some were in course of erection at the time of the writer's visit. One advantage to be derived from this new type is that it will dispense with the boy, the whole machine being under the control of the man. In all, including machines for the blades of pocket knives, there are close upon 80 hammers in use.

As the blade assumes its outline and shape in the course of hammering, the burr is cut off in machines, and afterward it is finished off under a tilt hammer. Two types of hammers are employed, one of the kind to be met with in Sheffield and American factories, and the other quite new, an invention of Mr. Albert Henckels. To work them it is claimed that one-quarter less power is required than is necessary for the ordinary make, and that against the one right to which the hammer-head rises above the anvil the height may be varied in Mr. Henckel's hammer as may be required, and without stopping the hammer should it be undesirable to cease work. The speed at which they run varies from 100 to 500 blows per minute, a simple shifting of the belt on a loose pulley being all that is requisite to alter the speed, and by means of a powerful brake each hammer may be instantly stopped. As to their capacity, it is stated that under them a ton of hard steel can be reduced from 2½ inches square to 1 inch square in 10 hours. For drawing the tangs of kitchen knives, of which knives the firm make 500 dozen per week, the machine consists practically of a pair of rolls; the lower roll is worked on an eccentric. Between the rolls, by virtue of the eccentric, there is at a certain point of the revolution a sufficient space to allow the tang end of the blade to be placed in between the rolls. In due time the lower roll is brought into contact with the upper roll, whereupon the end of the blade is struck with a blow sufficiently strong to draw it out, especially as the upper roll is not revolved by steam, but fitted so that by the force of the blow it is moved round a little. Such tangs as are riveted through the handles are drilled at the rate of three holes at a time, the wooden or other scales being also drilled in a similar manner. The tangs of table blades are forged under the same hammers as the blades themselves. In the case of scissors

and razors the same principle of manipulation is carried out, with the addition, in the case of scissors, that the eyes, first formed in outline, are afterward cut out by machines. The marking and the stamping of the name of the firm and the trade-mark are also done by machinery. As to hardening, it will only be necessary to remark that this is done in water and oil, and that the operation is conducted under the direct supervision of the partners.

In making tailors' scissors a departure from the practice common to table blades is made, viz., that, while the blades are of cast steel, the handles are of cast iron. This kind of make forms a considerable item in the firm's working, while other important departments are for shoemakers' and butchers' knives, special machines being laid down for their production. Corkscrews, too, enter more or less largely into the business of the firm, and every one of them is forged by machinery. Grinding and polishing are conducted very much after the fashion common to this country. All the grinding is done by hand, in the same way as described in previous article on swords. The stones are obtained from Trier. The firm make all their own dies, and keep an immense stock of them.

The large number of logs lying about the yard, and the attention bestowed upon the timber mills attached to the works, proclaim the fact that knives with wooden scales comprise an important part of the firm's business. But every other kind of scale is also used, from the most common kind to the most expensive; but in regard to these latter the work is not done so much upon the premises, it being chiefly done by men who work outside the factory. But for the knowledge that this outdoor system is carried on, some misapprehension might arise as to the character of the cutlery made. But such a knowledge and a glance around the warehouse will dispel any uncertainty upon the point. It has been often stated that German manufacturers are in the habit of stamping their own cutlery with Sheffield names and Sheffield marks, but it has never yet been said that German makers stamp Sheffield goods with German names and German marks; so that, however skeptical a visitor might be as to the superior quality of work turned out at this factory, the contents of the warehouse bespeaks the character of the work done. The wood chiefly used for scales is cherry and beech. The logs are first milled up in sawmills of large capacity, the saws for the mills being obtained from Remscheid, and are 4 feet 6 inches in diameter. The wood as it comes from these mills is next cut into smaller pieces, and upon a third set of machines into yet smaller pieces of an approximate size to the scale. All the gearing is beneath the floor, and the sawdust is carefully exhausted and carried away. The scales of an ordinary pattern are turned out at the rate per man of 23,000 a week, the entire shaping of the piece of wood, except in the case of carved handles or handles for bread knives, being done at one operation. Smoothing down the handles is also done in one operation. Curved handles are done upon a turning lathe after the fashion of turning gun stocks, and on most of the machines here used two handles are turned at once. Other kinds of handles largely employed are stamped out of metal.

Of the shops for the assembling and fitting of parts together, and of the departments incidental thereto, little was noticed that was different to what may be seen in any good cutlery shops; but the general mechanical appointments of the concern and the disposition of the plant for effective and economical working have evidently been well considered. Throughout the place there are 12 engines and seven boilers. The firm was established in 1840, but the present factory was not erected until 1852. The latter is built entirely of stone and iron, with a view to making it fire-proof. The number of employees, including those who work outside, amounts all told to about 1,400. The working hours are from 6 to 12, with half an hour for breakfast at about 8 o'clock, and from 1 to 7, with half an hour for tea at about 4 o'clock, for six days per week. Taken upon an average the daily earnings of men and boys amount to 2/7, but taking the men alone their earnings are about 4/ a day, everything being done on the piece-work system. When the number of stamping hammers made on Mr. Albert Henckel's patent is increased the number of boys employed will be reduced. A certain amount of the home trade and the export trade to North and South America is done from Solingen, but the Russian, Austrian and other Eastern business is carried on from the chief office of the firm, which is at Berlin. As to the workmen, it cannot be denied that they appeared robust and healthy, and by no means discontented. They are allowed to smoke at their work, a privilege, if such it may be termed, of which large numbers avail themselves.

Steel and Iron Making in Belgium.—The production of pig iron in Belgium in 1884 amounted to 750,812 tons, made up as follows: Refining pig, 547,328 tons; foundry pig, 50,620 tons; manganiferous pig, 538 tons; Bessemer pig, 130,990 tons; and Gilchrist-Thomas pig, 16,576 tons. In 1883 the aggregate production of pig in Belgium was 783,433 tons. The number of workmen engaged in the production of pig in Belgium in 1884 was 3180. The number of blast furnaces in activity in Belgium in 1884 was 36, and the number out of blast 25. The quantity of minerals used in the production of pig in Belgium in 1884 was: Belgian minerals, 987 tons; foreign minerals, 1,514,187 tons. The quantity of finished iron made in Belgium in 1884 was 471,040 tons. In 1883 the corresponding production of finished iron in Belgium was 487,226 tons. The number of workmen engaged in the production of finished pig in Belgium in 1884 was 15,957. The number of iron works in activity in Belgium in 1884 was 75, and the number idle was 14. The quantity of finished steel made in Belgium in 1884 was 153,999 tons, viz.: Rails, 112,930 tons; tires, 6667 tons; miscellaneous rolled steel, 10,701 tons; hammered steel, 11,036 tons; thick plates, 1848 tons; sheets, 530 tons, and wire, 7237 tons. Steel ingots were made in Belgium in 1884 to the extent of 185,916 tons, and blooms were

turned out to the extent of 1150 tons. The number of workmen engaged in the production of steel in Belgium in 1884 was 2508. In 1883 steel ingots were made in Belgium to the extent of 179,489 tons, and finished steel to the extent of 153,301 tons.

The First Rail Rolled in Italy.

The most important event during the past month in the annals of industry in Italy is without doubt the production of the first rail in that country. The Terni Iron and Steel Works which are the largest of the kind in Italy, may now claim to rank with some of the most important in Europe, not only on account of their extent, but also from their being furnished with machinery of the most modern description for the manufacture of steel rails, armor plates, as well for the production of iron and steel on a large scale. The new rail mills which were inaugurated at this establishment on May 14th by H. R. H. the Duke of Genoa—brother to the Queen of Italy—are driven by a turbine of 1000 horsepower. The first rail ever made in Italy is of the Vignoles type, 9 m. (29 feet 6 inches) long, weighing 36 kg. per meter (about 72½ pounds per yard), and was rolled at a single heat from an ingot of steel.

The new machinery for the manufacture of steel armor plates for the Italian navy is now nearly ready. The establishment is provided with all the necessary plant and appliances for the manufacture of Bessemer and Siemens-Martin steel on a large scale. The motive-power for the works is supplied by the torrent Velino, the water being brought for a distance of 6600 m. (about 4 miles) partly in tunnel by gravitation and partly by cast-iron mains, the water reaching the establishment with a pressure due to a head of 205.7 m. (about 675 feet), where it supplies no fewer than 46 turbines and a special apparatus for compressing air, which is distributed by a network of pipes to the various furnaces, hammers, cranes and other appliances.

The Terni Works have during the last few years secured some large contracts for the supply of cast-iron mains for water works in Italy, among which we may mention the whole of the pipes for the water supply to Naples and Venice, recently completed. The pipes for two great reversed siphons which carry the water of the Serino across the plains to Naples are the largest ever cast in Italy. They consist of three parallel lines; the first 27½ inches in diameter and 22 km. (about 13½ miles) in length, part of which is subject to a pressure due to a head of 18 atmospheres, supplies the upper part of the city, which the two others, which are 31½ inches in diameter and 20 km. (nearly 12½ miles) in length, under a maximum pressure of 10½ atmospheres, supply the lower part. The whole of the cast-iron mains for the Venice water works were also supplied by these works, the contract including a length of 4 miles of pipe 31½ inches in diameter, of which 2½ miles were laid under water. The establishment is lighted by electricity by 100 arc lamps and 500 incandescent Crute lamps; the installation was carried out by a Turin firm.

Construction and Testing of Air-Locks and Shaft-Tubes.

In an article on the subject of constructing and testing air-locks and shaft-tubes, by L. Brennecke, published in the excerpt minutes of the "Proceedings" of the British Institution of Civil Engineers, attention is directed to the fact that investigations as to the best methods of designing and testing the apparatus used for sinking foundations under a high air pressure have hitherto not been carried out, notwithstanding the disastrous consequences of an accident. The strains which an air-lock sustains are of a very unfavorable character, owing to the vibration caused by the work proceeding in its interior, and the constant changes of temperature and of pressure to which it must be subjected when in use. The bursting of an air-lock is instanced where the fractured portions on examination showed a highly crystalline structure, although the iron used in its manufacture had been of the best quality. Up to the present time the number of accidents known to have occurred in consequence of the bursting of air-locks is three, viz., first, in 1865, at Zeche Rheinpreussen, where two men were killed in the lock; second, in 1873, on the Tay Bridge works, where six men who were below in the excavating chamber lost their lives; third, in 1877, on the Alexander Bridge works, St. Petersburg, when to men were blown into the air and killed and 19 men below in the excavating chamber were drowned, their bodies not being recovered till 12 months later. These three accidents, spread over a period of 12 years, were the cause of a loss of 37 lives, which, compared with the statistics of the results of boiler explosions, show that air-lock accidents are much more disastrous; these considerations led to the conclusion that this apparatus should receive as much attention in the way of periodical examination and testing as is applied to steam boilers, an easy matter, as those now engaged constantly in testing steam boilers hydraulically could equally well carry out the testing of air-locks in a similar manner. There should also be rules formulated for enabling the strains upon the air-lock shafting, &c., to be easily found.

Mr. Brennecke intends publishing a series of calculations in reference to the strains upon the various parts of the whole apparatus in an early edition of the *Deutschen Bauhandbuch*, and he in this paper enters minutely by a series of equations into the question of the strains around the opening made in the wall of the cylindrical air-lock for the door, based upon the principle that a cylinder with closed ends under pressure from within is mainly subjected to two strains, the one $P \times R$ acting circumferentially and tending to split the cylinder wall vertically, and the second $\frac{P \times R}{2}$, or half the intensity of the first, acting at right angles to it—or in a direction parallel to the axis of the cylinder—where P = pressure on area of wall and

R = radius, from which is deduced that if the frame around the rectangular doorway be of insufficient strength rupture will commence at the angles, and he advises, in all cases with either rectangular or circular doorways, that, in addition to the framing at the side of the door, a ring of flat bar iron of a diameter equal to the diagonal of the rectangular door, and with a sectional area of $\frac{3}{4} \frac{P \times R \times a}{k}$ (where a = height of door opening and k = unit strain), shall be riveted to the wall of the cylinder. This will take the main strains above alluded to. The pressure in addition to the above, acting upon the back of the door from within outward, may be met by riveting an angle-iron ring on to the before-mentioned bar-iron ring.

Mr. Brennecke suggests that the adoption of certain rules—of which the following is an abstract—with regard to the working of air-locks and shafts might be of service, viz., the iron to be of the best quality, with a tensile resistance of 22.86 tons per square inch and 21.6 tons per square inch with and across the fiber respectively; cast iron may only be used for the tubes, which if subjected to pressure from within do not exceed 12 inches—30 cm.—in diameter, and if from without 24 inches—60 cm.—in diameter, and may not be used for those parts subjected to vibration; pipes of brass or copper may not exceed 4 inches in diameter, the coefficient of safety to be at least five times the strain; shaft tubing in calculation to be assumed as subject to occasional pressure from without. A manometer to be provided in each air-lock, also a plate affixed to the latter, giving the name of the manufacturer, the working pressure for which it is calculated, and the date of the trial test.

At every new installation, and also at intervals of not more than 12 months, while in use on the same works, the whole apparatus to be tested under a hydraulic pressure of twice the intended working pressure. In testing the full pressure shall be continued for at least 10 minutes without producing signs of weakness by the buckling of plates or escape of water other than in the form of dew. The result of this test to be entered in a register. An air-lock is at the extreme not to be in use for more than 1500 days, and in this amount the intervals between work are to be reckoned as one-fifth of the working time. During the second half of the above period the air-locks are to be used only in conjunction with the excavating chamber, in which the pressure does not exceed two thirds of that for which the air-lock was originally intended. As before remarked, after a period of 1500 working days, a lock should not under any circumstances be continued in use for high-pressure foundation works, and a register should be kept by some responsible person upon the works of the number of working hours and the degree of pressure from day to day. Regarding the shaft tubing, this may be considered serviceable for a period of 5000 working days, and a full allowance made for the hours when not in work, as the strains to which it is subjected are of a less unfavorable character than those sustained by the air-lock.

Damascening by Electrolysis.—A method of damascening metals by electrolysis has been brought out in France. Two copper plates are put into a bath of sulphate of copper solution, one being connected with the positive pole and the other with the negative pole of a battery. A thin layer of insulating varnish or wax is spread over one of the copper plates, viz., that connected to the positive pole, and the damascened device is etched on it. Now, since copper is by electrolysis transferred from this plate to the other plate, it follows that only the lines of the drawing can be attacked. A battery of two cells is sufficient for this purpose. When the plate has been bitten to the depth of 1 mm. it is removed from the bath and treated with hydrochloric acid to remove traces of oxide of copper in the lines of the drawing. It is then washed with water and suspended in a bath of nickel and silver and connected with the negative pole of the battery. The positive pole now consists of a plate of platinum. The silver or nickel deposits wherever the copper has been attacked, and the depressions are soon filled with foreign metal. The plate is then polished, and looks like one which has been damascened by hand.

The Solidification of Oxygen.—Professor Dewar has succeeded in the production of solid oxygen. At the Royal Institution he lately exhibited for the first time to a few friends the method he employs. Last year the professor gave a lecture on liquid air, but, although he and other experimenters had made liquid oxygen in small quantity, no one had succeeded in getting oxygen into a solid condition. The successful device employed at the Royal Institution depends upon allowing liquid oxygen to expand into a partial vacuum, when the enormous absorption of heat which accompanies the expansion results in the production of the solid substance. Oxygen in this condition resembles snow in appearance, and has a temperature of 200° C. below the freezing point of water. A supply of this material will enable chemists to approach the absolute zero of temperature and to investigate many interesting changes in the physical properties of bodies under the primordial condition of the temperature of space.

To make nails was one of the sentences imposed in Massachusetts 100 years ago as a punishment for crime, and 12 nails a day was accepted as a day's work. Nails then cost more than since machines were introduced.

McLanahan & Stone, of Hollidaysburg, Pa., have just completed the erection of a new ore-washing plant for the Warner Iron Co., at Nunnally, Tenn., including a set of their new ore jigs.

Nearly 100 chattel mortgages, representing about \$100,000 worth of property, were recorded in Chicago last week, as a result of poverty caused by strikes.

MECHANICAL.

Lost Energy.

Writing in the *London Engineer* some time ago, Prof. R. H. Smith referred in an interesting manner to the much-discussed subject of lost energy. Without entering into the mathematical portions of his articles, the following extract will be found to suggest a number of things worthy of thought. Professor Smith says:

We know that the ultimate useful resulting work done by our engines is never more than a comparatively small portion of that which is expended in making the steam do its work in the cylinders. In an engineer's machine shop the useful work done is that of cutting shavings off various pieces of metal and other substances, and is at each machine tool measured by the product of the pressure on the tool point by the length of surface cut. If the useful work so done amounts to a quarter or one fifth of the indicated power of the driving engines, the arrangements would be considered fairly satisfactory. In a spinning mill the useful work done consists in teasing out and twisting series of fine fibers, and we do not suppose that this final mechanical work done on the fibers amounts to more than a very small percentage of that done by the steam in the cylinders. In these and similar cases we are accustomed to satisfy our mechanical consciences—how guilty must we not often feel when we go on glibly proclaiming with unabashed boldness the "grand doctrine of the conservation of energy!"—by considering that the gearing between the driving piston and the final work is necessarily very complex, that it unavoidably involves a very large number of frictional rubbing surfaces, and that, therefore, a very large frictional waste of power cannot be helped. But since Professor Thurston's experiments were first published we know that the coefficients of friction at fairly lubricated journals are far smaller than they were formerly believed to be, and that in point of fact they are so minute that they will not help us to account for nearly all the power that we see continually disappearing we know not where from our workshops. Again, consider the case of a marine engine. Here the mechanism between the engine and the useful work done is extremely simple and direct, involving a very small number of frictional joints. Yet here, as is well known from Froude's experiments, the actual work done in hauling or pushing forward the ship through the water bears only a small proportion to the indicated power developed in the cylinders. Here, besides the frictional losses, we know of a large amount of energy thrown into the stream of water that the propellers have to discharge backward from the ship, because the screw does not gear in a solid nut, nor the paddle-wheel in a solid rack, which do not budge in obedience to the pressure put on them; the only abutment for the forward thrust on the ship is obtained in the resistance to backward acceleration of momentum offered by the water that is continually being thrown violently sternward. The screw-blades also, not being perpendicular to the line of motion, throw the water sideways and give it rotational or whirlpool motion, besides the absolutely necessary backward motion. But if we calculate liberal allowances for these evident losses there remains a large portion of the total loss known to exist by direct experimental evidence still to be accounted for.

My present object is to point out one way in which undoubtedly a considerable quantity of energy is wasted—in many cases, I fear, it is a very large amount. This source of loss may be shortly described by the one word "vibration." The vibration may be either slow or rapid. A vibration consists essentially in a periodic alternation of the condition of stress and strain in the mass vibrated. The vibration may be rapid, as in the "chattering" of a badly clamped tool. Throughout every part of an engine, including its frame and bed plate, there are an alternation and succession of changing stresses and strains, the full period of which coincides with that of the revolution of the crank-shaft. In a driving belt the period of the vibration is still slower; it is the time occupied by any one part of the belt in traveling from a definite position, say, on the tight side round the driving pulley, along the loose side, over the driving pulley, and back to the original position again on the tight side, which period is evidently the whole length of the belt, divided by the speed at which it runs.

Now, work is always spent in producing any sort of strain in whatever kind of material the strain is caused. For instance, if a certain length of belt be stretched by a force gradually increasing from 0 up to T_1 , and the effect be to stretch it a length, say CT , proportional to the force, then, since the average force is $\frac{1}{2}T_1$, the work done in stretching is $\frac{1}{2}CT^2$. In passing from the loose side, where the pull is, say, T_2 , to the tight side, where it is, say, T_1 , the work done in increasing the stretch would then be $\frac{1}{2}C(T_1^2 - T_2^2)$. Similarly in every other case of increase of strain we can calculate the amount of work done against the elastic and inelastic resistance to deformation. I am far from saying that the whole of work so done is lost. If it were so the efficiency of our machines would be even less by a good deal than it is. But a large part of it is lost. On the other hand, in some circumstances, nearly all of it is recovered in the shape of usefully performed work during that period of the vibration in which the piece is being unstrained again. Different members of a mechanism are very differently circumstanced as to the recovery of this strain energy. I notice, first, that in order that there may be a possibility of its recovery the strain must be an elastic one. So far as the strain is inelastic, the work spent in producing it is always absolutely lost without possibility of recovery. The bending of an iron or steel rope is about three-fourths inelastic, from one-tenth to three-eighths only being an elastic strain. Probably more than one-half of the bending strain of a leather belt is inelastic, while the direct tension strain in the belt has probably a large fraction of it elastic. So far as the inelastic strain is concerned, it takes as much work to

unstrain it—to straighten it out from the bent condition—as it did to bend it. Although the strain be wholly elastic, or nearly so, it by no means follows that the work periodically spent in producing it is wholly or even partially restored during the unstraining intervals of the vibration.

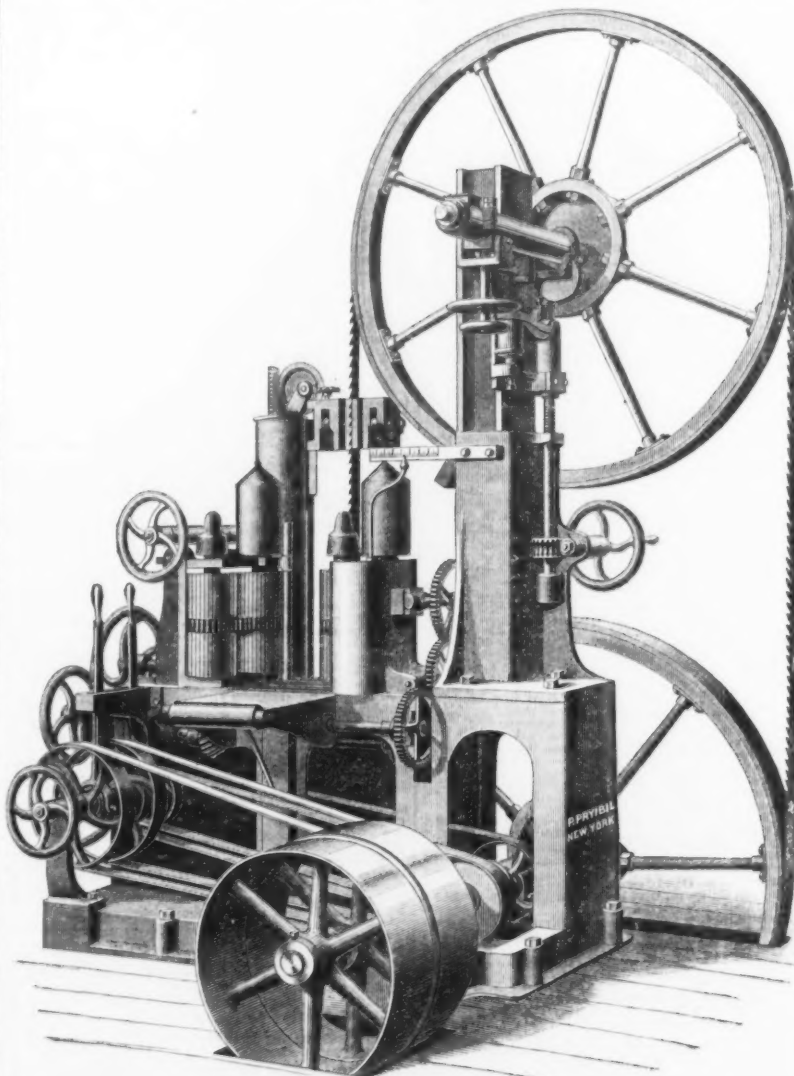
New Resawing Band-Saw Machine.

We show in the accompanying engraving a new resawing band-saw machine, just built by P. Prybil, 461 West Fortieth street, New York, and which presents several features of interest to wood-workers. The machine, according to the builder, will saw from 12,000 to 15,000 feet per day of 10 hours, making a kerf of only $\frac{1}{16}$ inch or less, and getting from 1-inch stuff, two pieces thick, enough to make two $\frac{3}{4}$ -inch panels after being planed on both sides. The importance of this point, especially when costly woods are used, is apparent. The feeding is effected by four strongly-

are furnished, and every machine is tested before leaving the factory. The weight of machine complete is about 6000 pounds, and the height of stuff that can be sawed is 30 inches.

The Corrosion of Boilers.

MM. Klein and A. Berg have been studying the action of sugars on the corrosion of boilers, and find that sugar in water has an acid reaction on iron which dissolves it, with a disengagement of hydrogen. The quantity of iron dissolved increases with the proportion of sugar in the water. The salt of iron formed is the acetate. A neutral decoction of malt also corrodes iron with disengagement of hydrogen; but glycerine and mannite are without action on the metal. These results are worthy of note in sugar refineries and places where sugar sometimes finds its way into the boilers by means of the water supplied. The experimenters in question also find that zinc is



NEW RESAWING BAND-SAW MACHINE, BUILT BY P. PRYBIL, NEW YORK.

geared live rolls and two smaller idle rolls, the latter being so arranged as to guide the last end of the stuff after it has passed the first pair of live rolls, and until the finish of the cut. Strong springs behind each of the bearings of the two feed rolls at the left of the saw hold these rolls up to the work and enable them to yield to all inequalities in the stuff. As either top or bottom of these rolls can yield independently or both together, a good bearing against the work is always insured, and the stuff is compelled to follow the guidance of the non-yielding rolls. Four rates of feed are provided, any one of which can be thrown into or out of operation by moving a hand lever and without belt shifting.

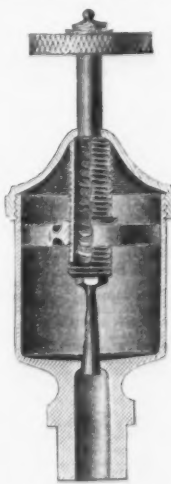
The saw runs between hardened-steel plates filled with dogwood plugs, with the end grain in contact with the saw, and each plate can be accurately adjusted by a single screw. The back of the saw bears against hardened-steel rollers which can be adjusted sideways as they become grooved from use. These rollers are also adjustable to different widths of saws, and are provided with self-oiling bearings. The upper guide is counterbalanced by a weight hidden in the guide-post, and is geared to a hand-wheel, by means of which its height can be easily varied. This hand wheel, the levers for changing the feed and the hand-wheels for setting the feed rolls are all accessible from the operator's position, and can be manipulated while the machine is in motion. The rims of the wheel are of bent ash, strong and light, and they overhang the ends of the bearings, which latter are self-oiling. The overhanging feature is quite important, effecting as it does the same result that some makers obtain by the use of outside bearings.

The upper shaft can be angled while the wheels are in motion. It is carried on a slide cushioned upon an adjustable spring which maintains a proper tension on the saw throughout all variations of length due to change of temperature. This, it is claimed, renders the saw much more secure against breakage than the weights commonly used for this purpose, as the inertia of weights prevents them from yielding quickly enough when a chip gets between the saw and the wheel, the result being a broken saw. To provide doubly against such an accident a wooden block is so fitted in the throat between saw and wheel as to catch all chips and sawdust and discharge them beyond the rim. The lower wheel is kept free from accumulations of sawdust by a scraper and the upper one by a brush. The body is a box-shaped casting in one piece, very strong and rigid, and it insures the permanent alignment of all the parts. The loose pulley is self-oiling, 1 inch smaller in diameter than the tight pulley, to slacken the belt when the machine is stopped, and it is provided with a step at the inner edge to cause the belt to shift easily. Fitted feed belts

strongly attacked by sugar; copper, tin, lead and aluminum are not attacked.

The Ballantine Automatic Grease Cup.

The Walker Mfg. Co., of Cleveland, Ohio, are putting on the market a new automatic grease cup, of which we append a sectional view. The cup body is bored out accurately and fitted with a piston. The discharge opening is reduced at its upper end, and the operating stem is provided with a finger-wheel. The lower end of this stem is tapered, the taper being made to agree with the varying amount of compression on the spring, so that the amount of grease delivered in the discharge opening may be uniform. In accomplishing this it will be seen



Automatic Grease Cup, Made by the Walker Mfg. Co., Cleveland, Ohio.

that the stem and spring are inversely related. Thus, when pressure is put on the grease, the spring is compressed, and the stem rising in the discharge opening closes the opening in proportion as the pressure is increased. Increasing the amount of pressure lengthens the time of automatic operation, and does not make the grease flow faster, as at first may be supposed. Should it be necessary to give an extra amount of grease at any time to a bearing, it is only necessary to press down on the finger-wheel. This does not in the least interfere with the automatic working of the cup.

It is obvious when the grease passes out of the cup that the spring under compression begins to elongate and weaken in pressure; at the same time the tapered stem passes further into the discharge opening, thereby increasing the opening at the neck as the pressure is diminished. When the stem has

traveled the length of the taper the finger-wheel is again operated to bring pressure on grease by piston moving down on thumb-screw on stem. Thus the cup can be emptied in two operations if necessary, or more at the will of the operator. Crank and cross-head pins, pitmans, loose pulleys and other moving parts of machinery can be lubricated by this grease cup without the inconvenience of oil being thrown around.

An Electric Traveling Crane.

An electric traveling crane is now at work at the warehouses of the Compagnie des Entrepôts et Magasins Généraux, at Roubaix, France. At these warehouses the cotton bales arriving mostly from America and La Plata are stored before being forwarded to the different cotton mills. On account of the great fire risk no steam crane is allowed in the establishment, and the bales, which weigh about $\frac{1}{2}$ ton each, had until recently to be hoisted and handled generally by manual labor. This work is now accomplished by a traveling crane worked electrically. The crane post is placed on a trolley which runs on rails, and a rail fixed to the ceiling of the warehouse guides the upper end of the post. The jib of the crane has a derrick motion. A small Gramme 4-horse power dynamo is fixed on the trolley. This is always kept running (900 revolutions per minute), and, being connected with suitable gearing, it can be made to hoist the load, advance the crane on the rails, and operate the jib. The current of 15 amperes, with an electro-motive force of 250 volts, is conveyed to the crane by overhead sliding contacts from the generator, which is a 6 horse power Gramme dynamo running at 1200 revolutions per minute. The commercial efficiency of this arrangement is stated to be 60 per cent. It shows, however, an economy in working, for, whereas formerly 10 men were required to handle 150 bales in 18 or 20 hours, now with this electric crane four men can do the same amount of work in three hours.

Gumming Saws.

Emerson Smith says that many persons who are not fully acquainted with the principle upon which circular saws are made entertain the erroneous opinion that a saw should work the same until worn out, if it is not accidentally sprung in use or strained in gumming. So far as any damage to the saw is concerned, there is no difference between the use of a burr gummer or a file; but if proper care is not exercised in the use of the emery-wheel there is more danger from its use than from either the file or burr. If the condition of the saw is such that a considerable depth is required to be cut into the plate, the operation should be performed by going over the saw several times, only allowing the wheel to grind away so much as can be done without heating the saw to a blue. There is no excuse whatever for crowding the emery-wheel so as to heat the saw red hot, as this is sure to injure the saw, often glazing it where the wheel comes in contact so hard that a file will make no impression whatever. From these hard spots on the outer surface small cracks commence, invisible at first to the eye, but gradually enlarging until they become dangerous fractures. Hacking the face of the wheel with a cold chisel or the corners of an old file will often prevent its glazing, so that it is not as liable to heat the saw. After a few times gumming, however, the saw will enlarge on the rim, so that the slightest warmth will cause it to buckle, and there is no remedy left but to send it to a saw-maker and have it rehammered. Some, however, entertain the erroneous impression that a saw rehammered will never run as well as when new. On the contrary, a saw rehammered will generally run better than when new, because all the elasticity, or nearly all, is worked out of the saw by using, and it generally works stiffer than when new.

A Novel Chimney Staging.

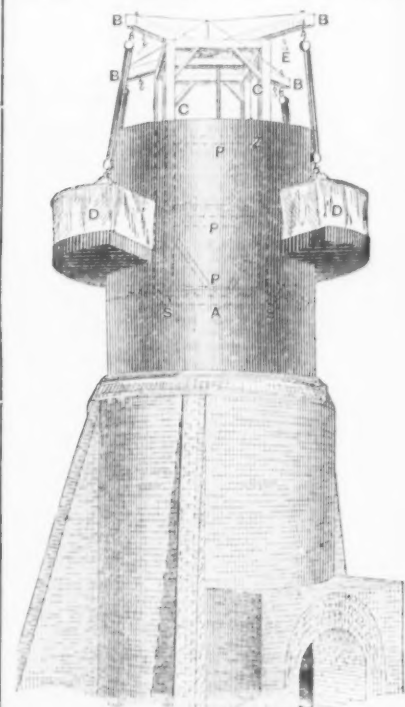
In a paper read at the recent Chicago meeting of the American Society of Mechanical Engineers, Mr. Frederick G. Coggin, of Lake Linden, Mich., supplied the following interesting account of a novel chimney staging:

In the fall of 1885 the Calumet and Hecla Mining Co. completed a new brick boiler-house for their stamping and concentrating works at Lake Linden, Mich. It was 206 feet long and 70 feet wide, giving room for 14 fire-box boilers, whose shells are 90 inches in diameter, with a total length of 34 feet. The chimney designed for this boiler-house was to be of wrought iron, 13 feet 7 inches in diameter and 165 feet high, above the brick base upon which it stood, and the top of the latter was 20 feet above the ground, making a total height of 185 feet above the surface. The courses were 5 feet high, with four sheets in each course, the ends and edges butted together, the joints being covered with straps riveted to the sheets on the outside. The first 10 courses were $\frac{3}{4}$ inch thick, the second $\frac{1}{2}$ inch, the third $\frac{1}{4}$ inch, the top three courses $\frac{1}{8}$ inch thick. The late arrival of the material for the chimney, with other circumstances, brought the commencement of its erection rather late in the season, so that it became a serious question as to whether it could be completed in time to allow the brick lining to be put in before the freezing weather set in. In fact, it became evident that with the ordinary method of staging it could not be done. Such a staging would have required 10 uprights of 8 x 8 inch timber, with the bracing necessary to hold them in position, and girding, and provision for a platform every 5 feet—i. e. for every course—sufficiently strong and wide to allow the workmen to stand outside for holding rivets and bolting together, all requiring not less than 20,000 feet of lumber.

Such a staging would have to be put up in sections, during the operations for which the ironwork would have to be suspended, and the time put upon the staging and platforms would be nearly as much as that for putting the plates in position and riveting, and the expense full as much. But, regardless of the question of extra cost, the delay which such a staging would occasion made it imperative to devise some more rapid method for raising the chimney, and the result was the plan illustrated in the accompanying engraving. This consisted of a frame about 9 feet square, with four 8 x 8

inch uprights 16 feet long, suitably braced and bolted together, with a platform at the bottom, one about 4 feet from the bottom, which carried the workmen while riveting, and one still higher for carrying the forge, &c., the platforms being indicated by the letter P. Upon the top of this frame were four arms, B, jointed at the center, through which it was bolted to a cross girder, but so as to allow it to swing freely. To the ends of these arms were suspended the cages D by blocks and falls, as shown. These cages extended a little more than one-quarter round the chimney, and consisted of a segmental platform about 3 feet wide, with a railing of gas-pipe and covered with canvas, to protect the workmen from the wind, and prevent the possibility of their falling. The whole thing required less than 1000 feet of lumber. The frame having been bolted together within the chimney base, the process of erection might be begun. The cast-iron ring upon which the chimney was to rest having been put in place upon the top of the base, a loose platform was laid over the opening, and the first two courses were raised into place with a "gin pole" and bolted together. Two snatch blocks were then hooked on to the upper sheet near the two opposite corner posts of the frame, at the bottom end of which were eye-bolts, into which were hooked the hoisting ropes, which passed up through the blocks and down to the bottom through another pair of blocks on to the drum of a small steam hoisting machine.

The temporary platform was then removed, and the frame was raised high enough so that the two sticks of timber A could be placed on top of the base under the uprights. The cross bars B were then put in place, and the cages D suspended, and the two courses were riveted together. The gin-pole was now laid aside, and the third course was put in place by the method to be used from that point to the top, the ease and facility of which are worth noting. In the arms B, just back of the eye bolts to which the cages were suspended, were other eye-bolts, E, into which was hung a snatch-block, over which was passed a rope leading from the hoisting machine, and hooked into the sheet upon the ground. As the sheet was raised the cage was swung out to allow it to pass up behind it, the sheet swinging naturally and easily into place, where it was secured with bolts. When the whole course was thus secured the snatch-blocks were hooked on to the top of the sheet as before,



A Novel Chimney Staging.

and the frame raised as before, so that the loose cross-beams A could be laid in the stirrups S, which had previously been bolted in place at the horizontal seam, and from this point up the frame, except when it was being raised, was resting upon the two cross-beams A hanging in the four stirrups, of which there were two sets, so that while the frame was hanging in one the other could be transferred to the seam above. There was therefore no delay, for, as each course was riveted up and another bolted in place ready for riveting, but a few moments were required to hook on the snatch blocks, raise the frame, transfer the cross-beams A to the next set of stirrups and drop the frame on to them. The sheet being riveted one-quarter round on the opposite sides, the cross-bars B were swung so that the cages covered the other two quarters, and the riveting was completed.

In this way, this traveling staging, carrying 11 men, went to the top with no trouble whatever, the operations following each other in rapid succession, and within 27 working days from the driving of the first rivet at the bottom the last rivet was driven at the top, including the hanging of three sets of guys, and painting the chimney inside and out. A cast-iron capping having been put in place, a permanent iron ladder was hung from top to bottom. The cages were then lowered to the ground and the frame taken apart and dropped, two pieces of timber being laid across the top, from an eye-bolt in which were hung blocks and falls for the purpose of raising a platform for putting in an 8-inch lining, which was done in about 20 days. The blocks were then lowered and the cross timbers dropped, and a completed chimney stood as a testimonial of the quickest time on record for such a job. The total weight of the chimney, including the base, ring and cap, is 100,105 pounds. The cost for the labor, including punching and rolling the sheets and straps, and all labor incidental to the erection, did not exceed 2 1/2 cents per pound.

The wall paper pool is menaced with dissolution as a result of cheaper materials and improved machinery for production.

[illegible]

WHOLESALE METAL PRICES, June 23, 1886.

METALS.

IRON.—Duty: Bars, 8-10¢ to 11-10¢ per lb. provided that no bar iron shall pay a less rate of duty than 35¢. Sheet, 11-0¢ to 15-10¢ per lb. Band, Hoop and Scrolled, 1¢ to 1 1/4-10¢ per lb. Railroad Bars weighing more than 25 lb per yard, 7-10¢ of 1¢ per lb.

Standard American Pig Iron.
Foundry No. 1, 18.50
Foundry No. 2, 17.00
Gray Forge, 16.00

No. 1 Scotch Pig Iron.
Carnegie, 18.50
Coltess, 17.50
Shotts, 17.50
Hengarnock, 18.50
Jarnbarn, 19.00
Langdon, 19.50
Sumner, 19.50
Laimington, 19.50
Eglinton, 19.50
Clyde, 19.50

Steel, at Eastern mills. 35.00
Old Halls, 35.00
Wrought, 35.00

Scrap.
Bar iron from store, 18.50

Common Iron:
3/4 to 1 in. round and square, 1.75
Refined iron:
3/4 to 1 in. round and square, 1.90
1 to 6 in. x 1/4 to 1 in., 2.10
Rods—1/2 and 1-1/2 round and sq., 2.30
Bands—1 to 6 in. round and sq., 2.50
Burden's Best, 1/2 in. base price, 2.50
Burden's 1/2 in. B. & S. Iron, base price, 2.50
Norway Nail Rods, 3.00

Sheet Iron from Store.
Common, 3.50
American, 3.50
Nos. 10 to 16, 3.50
17 to 20, 3.50
21 to 24, 3.50
25 and 26, 3.50
27, 3.50
28, 3.50
29, 3.50
30, 3.50
31, 3.50
32, 3.50
33, 3.50
34, 3.50
35, 3.50
36, 3.50
37, 3.50
38, 3.50
39, 3.50
40, 3.50
41, 3.50
42, 3.50
43, 3.50
44, 3.50
45, 3.50
46, 3.50
47, 3.50
48, 3.50
49, 3.50
50, 3.50
51, 3.50
52, 3.50
53, 3.50
54, 3.50
55, 3.50
56, 3.50
57, 3.50
58, 3.50
59, 3.50
60, 3.50
61, 3.50
62, 3.50
63, 3.50
64, 3.50
65, 3.50
66, 3.50
67, 3.50
68, 3.50
69, 3.50
70, 3.50
71, 3.50
72, 3.50
73, 3.50
74, 3.50
75, 3.50
76, 3.50
77, 3.50
78, 3.50
79, 3.50
80, 3.50
81, 3.50
82, 3.50
83, 3.50
84, 3.50
85, 3.50
86, 3.50
87, 3.50
88, 3.50
89, 3.50
90, 3.50
91, 3.50
92, 3.50
93, 3.50
94, 3.50
95, 3.50
96, 3.50
97, 3.50
98, 3.50
99, 3.50
100, 3.50

Galvanized Sheet Iron from Store.
Common, 3.50
American, 3.50
Nos. 10 to 16, 3.50
17 to 20, 3.50
21 to 24, 3.50
25 and 26, 3.50
27, 3.50
28, 3.50
29, 3.50
30, 3.50
31, 3.50
32, 3.50
33, 3.50
34, 3.50
35, 3.50
36, 3.50
37, 3.50
38, 3.50
39, 3.50
40, 3.50
41, 3.50
42, 3.50
43, 3.50
44, 3.50
45, 3.50
46, 3.50
47, 3.50
48, 3.50
49, 3.50
50, 3.50
51, 3.50
52, 3.50
53, 3.50
54, 3.50
55, 3.50
56, 3.50
57, 3.50
58, 3.50
59, 3.50
60, 3.50
61, 3.50
62, 3.50
63, 3.50
64, 3.50
65, 3.50
66, 3.50
67, 3.50
68, 3.50
69, 3.50
70, 3.50
71, 3.50
72, 3.50
73, 3.50
74, 3.50
75, 3.50
76, 3.50
77, 3.50
78, 3.50
79, 3.50
80, 3.50
81, 3.50
82, 3.50
83, 3.50
84, 3.50
85, 3.50
86, 3.50
87, 3.50
88, 3.50
89, 3.50
90, 3.50
91, 3.50
92, 3.50
93, 3.50
94, 3.50
95, 3.50
96, 3.50
97, 3.50
98, 3.50
99, 3.50
100, 3.50

Iron Wire.—(See Wire.)
STEEL.—Duty: Ingots, Bars, Sheets, &c., valued at 4¢ per lb. or less, 45¢ ad. val.; valued above 4¢ and not above 7¢ per lb., 35¢ ad. val.; valued above 7¢ and not above 10¢ per lb., 30¢ ad. val.; valued above 10¢ per lb., 25¢ ad. val. Steel Bars, Rods, &c., cold hammered or polished, in any way in addition to ordinary hot rolling, 1/4¢ per lb. in addition to above; Steel Circular Saw Plates, 1¢ per lb. in addition to the above.

American Cast Steel.
For American Steel, see Pittsburgh quotations.
Chrome Steel.
Tool Steel, ordinary sizes, 3/4 to 3 inches, 10 to 14¢
Admiralty Steel and Dies, 8 to 9¢
Magnet Steel, 14 to 15¢

English Steel.
Best Cast, 15¢
Extra Cast, 16¢
Circular Saw Plates, 10¢
Round Machinery Cast, 10¢
Swaged Cast, 10¢
Best Double Shear, 10¢
Blister, 1st quality, 14¢
German Steel, Best, 10¢
3d quality, 9¢
3d quality, 8¢
Sheet Cast Steel, 1st quality, 15¢
2d quality, 14¢
3d quality, 13¢

TIN.—Duty: Plates, Sheets, Tagger and Ternes, 1¢ per lb.; Bars, Block and Pigs free.
Macon, 24¢
Strait, 24¢
English, 24¢
Bar, 24¢

Charcoal Tin Plates.
1 C 10x14 25 sheets, 5.00
1 C 12x18 25 sheets, 5.25
1 C 14x22 25 sheets, 5.50
1 C 16x26 25 sheets, 5.75
1 C 18x30 25 sheets, 6.00
1 C 20x34 25 sheets, 6.25
1 C 22x38 25 sheets, 6.50
1 C 24x42 25 sheets, 6.75
1 C 26x46 25 sheets, 7.00
1 C 28x50 25 sheets, 7.25
1 C 30x54 25 sheets, 7.50
1 C 32x58 25 sheets, 7.75
1 C 34x62 25 sheets, 8.00
1 C 36x66 25 sheets, 8.25
1 C 38x70 25 sheets, 8.50
1 C 40x74 25 sheets, 8.75
1 C 42x78 25 sheets, 9.00
1 C 44x82 25 sheets, 9.25
1 C 46x86 25 sheets, 9.50
1 C 48x90 25 sheets, 9.75
1 C 50x94 25 sheets, 10.00
1 C 52x98 25 sheets, 10.25
1 C 54x102 25 sheets, 10.50
1 C 56x106 25 sheets, 10.75
1 C 58x110 25 sheets, 11.00
1 C 60x114 25 sheets, 11.25
1 C 62x118 25 sheets, 11.50
1 C 64x122 25 sheets, 11.75
1 C 66x126 25 sheets, 12.00
1 C 68x130 25 sheets, 12.25
1 C 70x134 25 sheets, 12.50
1 C 72x138 25 sheets, 12.75
1 C 74x142 25 sheets, 13.00
1 C 76x146 25 sheets, 13.25
1 C 78x150 25 sheets, 13.50
1 C 80x154 25 sheets, 13.75
1 C 82x158 25 sheets, 14.00
1 C 84x162 25 sheets, 14.25
1 C 86x166 25 sheets, 14.50
1 C 88x170 25 sheets, 14.75
1 C 90x174 25 sheets, 15.00
1 C 92x178 25 sheets, 15.25
1 C 94x182 25 sheets, 15.50
1 C 96x186 25 sheets, 15.75
1 C 98x190 25 sheets, 16.00
1 C 100x194 25 sheets, 16.25
1 C 102x198 25 sheets, 16.50
1 C 104x202 25 sheets, 16.75
1 C 106x206 25 sheets, 17.00
1 C 108x210 25 sheets, 17.25
1 C 110x214 25 sheets, 17.50
1 C 112x218 25 sheets, 17.75
1 C 114x222 25 sheets, 18.00
1 C 116x226 25 sheets, 18.25
1 C 118x230 25 sheets, 18.50
1 C 120x234 25 sheets, 18.75
1 C 122x238 25 sheets, 19.00
1 C 124x242 25 sheets, 19.25
1 C 126x246 25 sheets, 19.50
1 C 128x250 25 sheets, 19.75
1 C 130x254 25 sheets, 20.00
1 C 132x258 25 sheets, 20.25
1 C 134x262 25 sheets, 20.50
1 C 136x266 25 sheets, 20.75
1 C 138x270 25 sheets, 21.00
1 C 140x274 25 sheets, 21.25
1 C 142x278 25 sheets, 21.50
1 C 144x282 25 sheets, 21.75
1 C 146x286 25 sheets, 22.00
1 C 148x290 25 sheets, 22.25
1 C 150x294 25 sheets, 22.50
1 C 152x298 25 sheets, 22.75
1 C 154x302 25 sheets, 23.00
1 C 156x306 25 sheets, 23.25
1 C 158x310 25 sheets, 23.50
1 C 160x314 25 sheets, 23.75
1 C 162x318 25 sheets, 24.00
1 C 164x322 25 sheets, 24.25
1 C 166x326 25 sheets, 24.50
1 C 168x330 25 sheets, 24.75
1 C 170x334 25 sheets, 25.00
1 C 172x338 25 sheets, 25.25
1 C 174x342 25 sheets, 25.50
1 C 176x346 25 sheets, 25.75
1 C 178x350 25 sheets, 26.00
1 C 180x354 25 sheets, 26.25
1 C 182x358 25 sheets, 26.50
1 C 184x362 25 sheets, 26.75
1 C 186x366 25 sheets, 27.00
1 C 188x370 25 sheets, 27.25
1 C 190x374 25 sheets, 27.50
1 C 192x378 25 sheets, 27.75
1 C 194x382 25 sheets, 28.00
1 C 196x386 25 sheets, 28.25
1 C 198x390 25 sheets, 28.50
1 C 200x394 25 sheets, 28.75
1 C 202x398 25 sheets, 29.00
1 C 204x402 25 sheets, 29.25
1 C 206x406 25 sheets, 29.50
1 C 208x410 25 sheets, 29.75
1 C 210x414 25 sheets, 30.00
1 C 212x418 25 sheets, 30.25
1 C 214x422 25 sheets, 30.50
1 C 216x426 25 sheets, 30.75
1 C 218x430 25 sheets, 31.00
1 C 220x434 25 sheets, 31.25
1 C 222x438 25 sheets, 31.50
1 C 224x442 25 sheets, 31.75
1 C 226x446 25 sheets, 32.00
1 C 228x450 25 sheets, 32.25
1 C 230x454 25 sheets, 32.50
1 C 232x458 25 sheets, 32.75
1 C 234x462 25 sheets, 33.00
1 C 236x466 25 sheets, 33.25
1 C 238x470 25 sheets, 33.50
1 C 240x474 25 sheets, 33.75
1 C 242x478 25 sheets, 34.00
1 C 244x482 25 sheets, 34.25
1 C 246x486 25 sheets, 34.50
1 C 248x490 25 sheets, 34.75
1 C 250x494 25 sheets, 35.00
1 C 252x498 25 sheets, 35.25
1 C 254x502 25 sheets, 35.50
1 C 256x506 25 sheets, 35.75
1 C 258x510 25 sheets, 36.00
1 C 260x514 25 sheets, 36.25
1 C 262x518 25 sheets, 36.50
1 C 264x522 25 sheets, 36.75
1 C 266x526 25 sheets, 37.00
1 C 268x530 25 sheets, 37.25
1 C 270x534 25 sheets, 37.50
1 C 272x538 25 sheets, 37.75
1 C 274x542 25 sheets, 38.00
1 C 276x546 25 sheets, 38.25
1 C 278x550 25 sheets, 38.50
1 C 280x554 25 sheets, 38.75
1 C 282x558 25 sheets, 39.00
1 C 284x562 25 sheets, 39.25
1 C 286x566 25 sheets, 39.50
1 C 288x570 25 sheets, 39.75
1 C 290x574 25 sheets, 40.00
1 C 292x578 25 sheets, 40.25
1 C 294x582 25 sheets, 40.50
1 C 296x586 25 sheets, 40.75
1 C 298x590 25 sheets, 41.00
1 C 300x594 25 sheets, 41.25
1 C 302x598 25 sheets, 41.50
1 C 304x602 25 sheets, 41.75
1 C 306x606 25 sheets, 42.00
1 C 308x610 25 sheets, 42.25
1 C 310x614 25 sheets, 42.50
1 C 312x618 25 sheets, 42.75
1 C 314x622 25 sheets, 43.00
1 C 316x626 25 sheets, 43.25
1 C 318x630 25 sheets, 43.50
1 C 320x634 25 sheets, 43.75
1 C 322x638 25 sheets, 44.00
1 C 324x642 25 sheets, 44.25
1 C 326x646 25 sheets, 44.50
1 C 328x650 25 sheets, 44.75
1 C 330x654 25 sheets, 45.00
1 C 332x658 25 sheets, 45.25
1 C 334x662 25 sheets, 45.50
1 C 336x666 25 sheets, 45.75
1 C 338x670 25 sheets, 46.00
1 C 340x674 25 sheets, 46.25
1 C 342x678 25 sheets, 46.50
1 C 344x682 25 sheets, 46.75
1 C 346x686 25 sheets, 47.00
1 C 348x690 25 sheets, 47.25
1 C 350x694 25 sheets, 47.50
1 C 352x698 25 sheets, 47.75
1 C 354x702 25 sheets, 48.00
1 C 356x706 25 sheets, 48.25
1 C 358x710 25 sheets, 48.50
1 C 360x714 25 sheets, 48.75
1 C 362x718 25 sheets, 49.00
1 C 364x722 25 sheets, 49.25
1 C 366x726 25 sheets, 49.50
1 C 368x730 25 sheets, 49.75
1 C 370x734 25 sheets, 50.00
1 C 372x738 25 sheets, 50.25
1 C 374x742 25 sheets, 50.50
1 C 376x746 25 sheets, 50.75
1 C 378x750 25 sheets, 51.00
1 C 380x754 25 sheets, 51.25
1 C 382x758 25 sheets, 51.50
1 C 384x762 25 sheets, 51.75
1 C 386x766 25 sheets, 52.00
1 C 388x770 25 sheets, 52.25
1 C 390x774 25 sheets, 52.50
1 C 392x778 25 sheets, 52.75
1 C 394x782 25 sheets, 53.00
1 C 396x786 25 sheets, 53.25
1 C 398x790 25 sheets, 53.50
1 C 400x794 25 sheets, 53.75
1 C 402x798 25 sheets, 54.00
1 C 404x802 25 sheets, 54.25
1 C 406x806 25 sheets, 54.50
1 C 408x810 25 sheets, 54.75
1 C 410x814 25 sheets, 55.00
1 C 412x818 25 sheets, 55.25
1 C 414x822 25 sheets, 55.50
1 C 416x826 25 sheets, 55.75
1 C 418x830 25 sheets, 56.00
1 C 420x834 25 sheets, 56.25
1 C 422x838 25 sheets, 56.50
1 C 424x842 25 sheets, 56.75
1 C 426x846 25 sheets, 57.00
1 C 428x850 25 sheets, 57.25
1 C 430x854 25 sheets, 57.50
1 C 432x858 25 sheets, 57.75
1 C 434x862 25 sheets, 58.00
1 C 436x866 25 sheets, 58.25
1 C 438x870 25 sheets, 58.50
1 C 440x874 25 sheets, 58.75
1 C 442x878 25 sheets, 59.00
1 C 444x882 25 sheets, 59.25
1 C 446x886 25 sheets, 59.50
1 C 448x890 25 sheets, 59.75
1 C 450x894 25 sheets, 60.00
1 C 452x898 25 sheets, 60.25
1 C 454x902 25 sheets, 60.50
1 C 456x906 25 sheets, 60.75
1 C 458x910 25 sheets, 61.00
1 C 460x914 25 sheets, 61.25
1 C 462x918 25 sheets, 61.50
1 C 464x922 25 sheets, 61.75
1 C 466x926 25 sheets, 62.00
1 C 468x930 25 sheets, 62.25
1 C 470x934 25 sheets, 62.50
1 C 472x938 25 sheets, 62.75
1 C 474x942 25 sheets, 63.00
1 C 476x946 25 sheets, 63.25
1 C 478x950 25 sheets, 63.50
1 C 480x954 25 sheets, 63.75
1 C 482x958 25 sheets, 64.00
1 C 484x962 25 sheets, 64.25
1 C 486x966 25 sheets, 64.50
1 C 488x970 25 sheets, 64.75
1 C 490x974 25 sheets, 65.00
1 C 492x978 25 sheets, 65.25
1 C 494x982 25 sheets, 65.50
1 C 496x986 25 sheets, 65.75
1 C 498x990 25 sheets, 66.00
1 C 500x994 25 sheets, 66.25
1 C 502x998 25 sheets, 66.50
1 C 504x1002 25 sheets, 66.75
1 C 506x1006 25 sheets, 67.00
1 C 508x1010 25 sheets, 67.25
1 C 510x1014 25 sheets, 67.50
1 C 512x1018 25 sheets, 67.75
1 C 514x1022 25 sheets, 68.00
1 C 516x1026 25 sheets, 68.25
1 C 518x1030 25 sheets, 68.50
1 C 520x1034 25 sheets, 68.75
1 C 522x1038 25 sheets, 69.00
1 C 524x1042 25 sheets, 69.25
1 C 526x1046 25 sheets, 69.50
1 C 528x1050 25 sheets, 69.75
1 C 530x1054 25 sheets, 70.00
1 C 532x1058 25 sheets, 70.25
1 C 534x1062 25 sheets, 70.50
1 C 536x1066 25 sheets, 70.75
1 C 538x1070 25 sheets, 71.00
1 C 540x1074 25 sheets, 71.25
1 C 542x1078 25 sheets, 71.50
1 C 544x1082 25 sheets, 71.75
1 C 546x1086 25 sheets, 72.00
1 C 548x1090 25 sheets, 72.25
1 C 550x1094 25 sheets, 72.50
1 C 552x1098 25 sheets, 72.75
1 C 554x1102 25 sheets, 73.00
1 C 556x1106 25 sheets, 73.25
1 C 558x1110 25 sheets, 73.50
1 C 560x1114 25 sheets, 73.75
1 C 562x1118 25 sheets, 74.00
1 C 564x1122 25 sheets, 74.25
1 C 566x1126 25 sheets, 74.50
1 C 568x1130 25 sheets, 74.75
1 C 570x1134 25 sheets, 75.00
1 C 572x1138 25 sheets, 75.25
1 C 574x1142 25 sheets, 75.50
1 C 576x1146 25 sheets, 75.75
1 C 578x1150 25 sheets, 76.00
1 C 580x1154 25 sheets, 76.25
1 C 582x1158 25 sheets, 76.50
1 C 584x1162 25 sheets, 76.75
1 C 586x1166 25 sheets, 77.00
1 C 588x1170 25 sheets, 77.25
1 C 590x1174 25 sheets, 77.50
1 C 592x1178 25 sheets, 77.75
1 C 594x1182 25 sheets, 78.00
1 C 596x1186 25 sheets, 78.25
1 C 598x1190 25 sheets, 78.50
1 C 600x1194 25 sheets, 78.75
1 C 602x1198 25 sheets, 79.00
1 C 604x1202 25 sheets, 79.25
1 C 606x1206 25 sheets, 79.50
1 C 608x1210 25 sheets, 79.75
1 C 610x1214 25 sheets, 80.00
1 C 612x1218 25 sheets, 80.25
1 C 614x1222 25 sheets, 80.50
1 C 616x1226 25 sheets, 80.75
1 C 618x1230 25 sheets, 81.00
1 C 620x1234 25 sheets, 81.25
1 C 622x1238 25 sheets, 81.50
1 C 624x1242 25 sheets, 81.75
1 C 626x1246 25 sheets, 82.00
1 C 628x1250 25 sheets, 82.25
1 C 630x1254 25 sheets, 82.50
1 C 632x1258 25 sheets, 82.75
1 C 634x1262 25 sheets, 83.00
1 C 636x1266 25 sheets, 83.25
1 C 638x1270 25 sheets, 83.50
1 C 640x1274 25 sheets, 83.75
1 C 642x1278 25 sheets, 84.00
1 C 644x1282 25 sheets, 84.25
1 C 646x1286 25 sheets, 84.50
1 C 648x1290 25 sheets, 84.75
1 C 650x1294 25 sheets, 85.00
1 C 652x1298 25 sheets, 85.25
1 C 654x1302 25 sheets, 85.50
1 C 656x1306 25 sheets, 85.75
1 C 658x1310 25 sheets, 86.00
1 C 660x1314 25 sheets, 86.25
1 C 662x1318 25 sheets, 86.50
1 C 664x1322 25 sheets, 86.75
1 C 666x1326 25 sheets, 87.00
1 C 668x1330 25 sheets, 87.25
1 C 670x1334 25 sheets, 87.50
1 C 672x1338 25 sheets, 87.75
1 C 674x1342 25 sheets, 88.00
1 C 676x1346 25 sheets, 88.25
1 C 678x1350 25 sheets, 88.50
1 C 680x1354 25 sheets, 88.75
1 C 682x1358 25 sheets, 89.00
1 C 684x1362 25 sheets, 89.25
1 C 686x1366 25 sheets, 89.50
1 C 688x1370 25 sheets, 89.75
1 C 690x1374 25 sheets, 90.00
1 C 692x1378 25 sheets, 90.25
1 C 694x1382 25 sheets, 90.50
1 C 696x1386 25 sheets, 90.75
1 C 698x1390 25 sheets, 91.00
1 C 700x1394 25 sheets, 91.25
1 C 702x1398 25 sheets, 91.50
1 C 704x1402 25 sheets, 91.75
1 C 706x1406 25 sheets, 92.00
1 C 708x1410 25 sheets, 92.25
1 C 710x1414 25 sheets, 92.50
1 C 712x1418 25 sheets, 92.75
1 C 714x1422 25 sheets, 93.00
1 C 716x1426 25 sheets, 93.25
1 C 718x1430 25 sheets, 93.50
1 C 720x1434 25 sheets, 93.75
1 C 722x1438 25 sheets, 94.00
1 C 724x1442 25 sheets, 94.25
1 C 726x1446 25 sheets, 94.50
1 C 728x1450 25 sheets, 94.75
1 C 730x1454 25 sheets, 95.00
1 C 732x1458 25 sheets, 95.25
1 C 734x1462 25 sheets, 95.50
1 C 736x1466 25 sheets, 95.75
1 C 738x1470 25 sheets, 96.00
1 C 740x1474 25 sheets, 96.25
1 C 742x1478 25 sheets, 96.50
1 C 744x1482 25 sheets, 96.75
1 C 746x1486 25 sheets, 97.00
1 C 748x1490 25 sheets, 97.25
1 C 750x1494 25 sheets, 97.50
1 C 752x1498 25 sheets, 97.75
1 C 754x1502 25 sheets, 98.00
1 C 756x1506 25 sheets, 98.25
1 C 758x1510 25 sheets, 98.50
1 C 760x1514 25 sheets, 98.75
1 C 762x1518 25 sheets, 99.00
1 C 764x1522 25 sheets, 99.25
1 C 766x1526 25 sheets, 99.50
1 C 768x1530 25 sheets, 99.75
1 C 770x1534 25 sheets, 100.00
1 C 772x1538 25 sheets, 100.25
1 C 774x1542 25 sheets, 100.50
1 C 776x1546 25 sheets, 100.75
1 C 778x1550 25 sheets, 101.00
1 C 780x1554 25 sheets, 101.25
1 C 782x1558 25 sheets, 101.50
1 C 784x1562 25 sheets, 101.75
1 C 786x1566 25 sheets, 102.00
1 C 788x1570

Hardware Novelties.

The Perfection Postal Scale.

The accompanying illustrations, Figs. 1 and 2, represent this scale, which is made by the American Machine Co., Philadelphia. Fig. 1 represents the scales Nos. 100, 101, 105 and 106, which weigh up to $\frac{1}{4}$ and $\frac{1}{2}$ pound, and Fig. 2 represents the scales weighing up to 4 pounds, Nos. 140, 141, 145 and 146. Both scales are manufactured on the same principle, which is that of the company's Perfection scale, a description of which we gave in this department some time ago. It has recently been adapted in the production of these goods to the weighing of mail matter. In the application of this principle the scale is made with a series of small automatic weights, which are out of

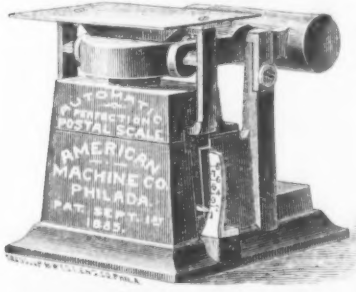


Fig. 1.—Perfection Postal Scale— $\frac{1}{4}$ and $\frac{1}{2}$ Pound.

sight, but when letters or small packages are placed on the scale the pointer instantly and without variation indicates the weight on which postage must be paid, always including the fractional part of the unit as a full unit. Thus in scale No. 100, shown in Fig. 1, which weighs from 1 ounce to 8 ounces, any parcel weighing 1 ounce or less will bring the pointer to the 1-ounce mark, and the weight of more than 1, and not more than 2 ounces will bring it to the 2-ounce mark, and so on. The scale represented in Fig. 2 has a capacity of 4 pounds, and the poise weight on its beam is movable only to the multiples of the amount of the series of weights, and is to be used only when weighing heavy packages. Then by moving it to the proper notch to bring the automatic weights into action the pointer will at once indicate the additional weight of the package. Thus in the scale shown in Fig. 2 there are eight 1-ounce automatic weights, which are indicated at the end of the beam, and the beam is notched at each

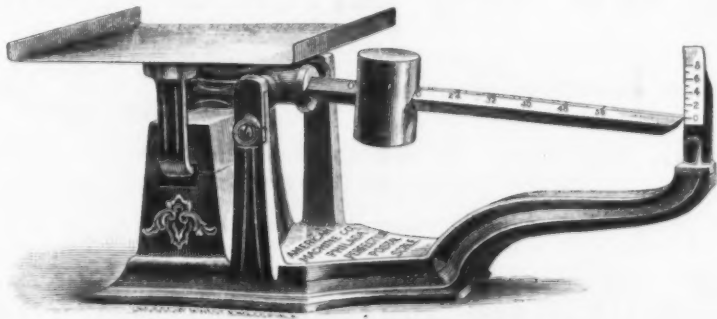
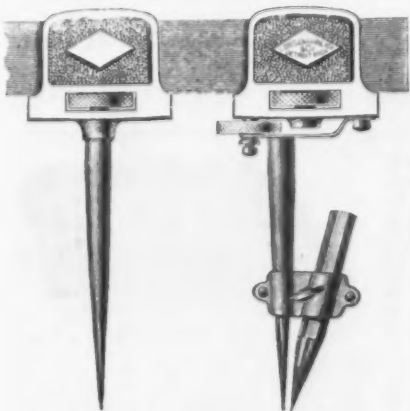


Fig. 2.—Perfection Postal Scale—4 Pounds.

8 ounces only. When weighing a parcel, for example, of more than 13 ounces and not more than 14 ounces, the poise weight must be moved to the 8-ounce notch, when the end of the beam will at once point to the 6: $8 + 6 = 14$, which is the weight for postage. These scales are finished in black japan, ornamented, with brass pan, beam and weight. There are also made with the brass parts nickel-plated. Nos. 100, 101, 140 and 141 are intended for weighing by ounces, while Nos. 105, 106, 145 and 146 weigh by half ounces. The simplicity and accuracy of this scale, and the facility with which packages can be weighed on it, are alluded to, as well as the fact that it is a weight scale, having no springs whatever in its construction. It has recently been placed in the Boston, Baltimore, Philadelphia and Washington post offices on trial, where it is reported to be giving the best satisfaction.

Diamond Trammels.

A form of beam compass that will interest draftsmen and mechanics who have occasion to sweep large circles is shown in the illustration herewith. In construction the article is a radical departure from forms in previous use. The heads are clamped against the bar by turning screws, the milled heads of which are shown in the en-



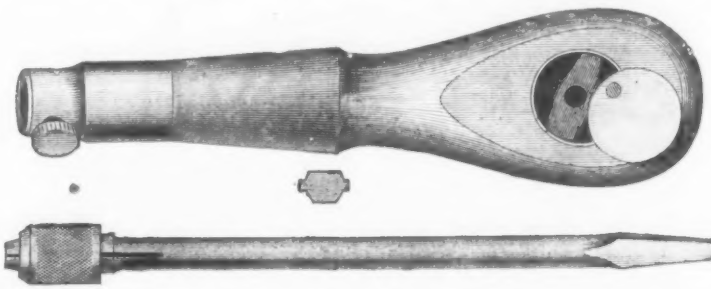
The Diamond Trammels.

graving projecting through the casting just below the bar. By means of this screw the heads are fastened at any required point quickly and securely. In loosening the clamp the nut drops away from the bar, which allows the head to slide freely. Extreme accuracy in setting the tool is obtained by a second screw in one of the heads. By referring to the engraving it will be seen that the point is pivoted directly above the

head of the lead pencil, shown in the cut. By turning the nut on the opposite side the position of the point against the paper or other material to be scribed may be varied as much as $\frac{1}{4}$ inch. In the use of the trammels, therefore, the head is set as nearly right as possible, and then further adjustment is obtained by this means. In the engraving is shown an attachment by which a pencil may be added to one of the points. The construction of this attachment is such that a pencil of considerable length may be inserted and allowed to wear down. It is not necessary to whittle a pencil, to its detriment, in order to insert it in the holder. Four sizes of this instrument are made, the bar of the lightest being $\frac{1}{4}$ by $\frac{1}{2}$ inch, and of the largest $\frac{3}{4}$ by $1\frac{1}{2}$ inches. Charles A. Strelinger & Co., of Detroit, Mich., are the sole agents. The engraving shows the medium size a little more than half full size.

Pratt's Multifarm Screw-Driver.

In the cut we show the present form of this screw-driver, which is made by the Millers Falls Co., No. 74 Chambers street, New York City. The handle, as before, serves the purpose of holding the stock furnished with it or any other tool that may



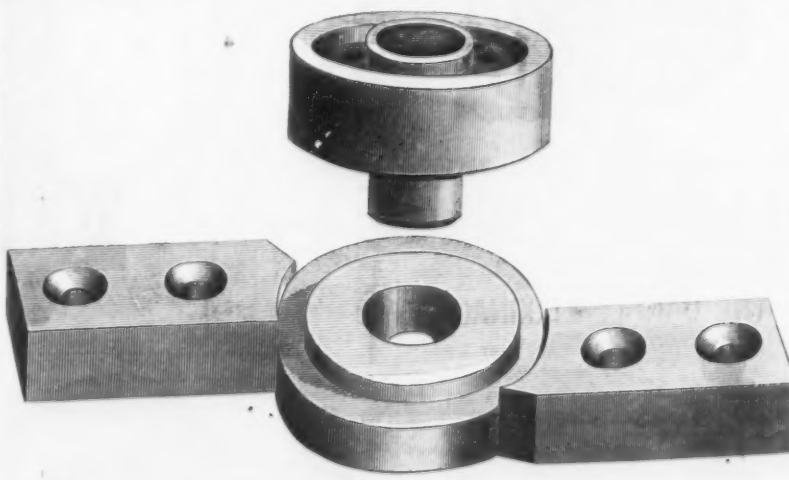
Pratt's Multifarm Screw-Driver.

be advantageously employed in it, as, for example, a brace bit, a reamer or a chisel. The stock of this tool is provided with a chuck which firmly holds the driver points, which are put in and out instantly by turning the sleeve. Ten bits or points are furnished with the tool, either end of which may be used, thus making the one tool equal to 20 screw-drivers in all. These points are made of varying widths and thicknesses, so as to fit any screw from the largest to the smallest. They are made flat on both sides, so they are not liable to slip out of the slot or work off the screw-head. The points, except the one in use, are conveniently stored in the box provided for them in the handle.

In addition to the screw-driver points the manufacturers furnish a flat countersink for wood or iron which fits the chuck, thus increasing the range of the work for which the tool is adapted. The chuck is of such a character as to hold a variety of small tools such as twist drills, in case it is desired to employ them for any purpose. The stock is of a kind to be used in a brace where there is a large number of screws to be driven. The stock is held in the handle by a round-head thumb-screw, clearly shown in the engraving. The handle is of polished rosewood and 7 inches in length. The stock is $\frac{3}{4}$ inch around, and is of highly-polished steel, heavily nickel-plated. It is the same length as the handle, making the tool some 14 inches in all when the two parts are combined.

New Sash Pivot.

A. G. Newman of No. 1180 Broadway, New York City, has recently put upon the market a sash pivot which is shown in the



New Sash Pivot.

cut. The device consists of two brass castings, one of which is fastened to the frame and the other to the sash, in case the sash is to be pivoted horizontally, and to the sash and sill where the sash is to be pivoted vertically. One part, it will be seen, has a raised circular projection with a hole in the center, in which the pivot of the other part revolves. The opposite side has a projecting circular rim which fits over the raised part of the other and is pivoted in the center with an iron pivot entering the hole in the opposite fixture. The abutting surfaces of the sash and frame, or sash and sill, as the case may be, are rabbeted on opposite edges,

so that when the sash is closed a tight fit is made. This sash pivot is made of different sizes and is applicable to sash from $1\frac{1}{2}$ to $3\frac{1}{4}$ inches in thickness.

Ormsby Sash Balance.

The Ormsby Sash Holder Co., No. 92 Utica street, Boston, are introducing a substitute for weights and pulleys for hanging window sash that they claim has merits over any



Fig. 1.—The Ormsby Spring Roll Sash Balance.

other system in use. The nature of the device will be understood by comparing it to the spring rollers which are in common use for window shades. A roller is provided above and in line with each sash, and the sash is connected with the same by means of brass ribbons, as illustrated in Figs. 2 and 3 of the engravings. The spring balance may be arranged on windows in old houses where weights and pulleys have not been

provided, as illustrated in Fig. 2, and it may be used in the construction of new houses, as shown in Fig. 3. In the one instance it is placed below the top jamb, and in the other case it is boxed into the top of

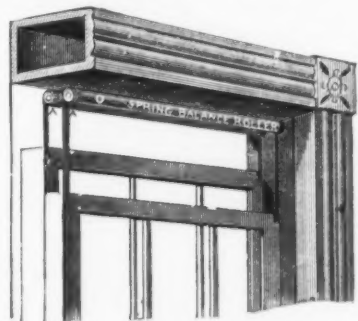


Fig. 2.—The Ormsby Sash Balance Applied to Old Windows.

the frame, so as to be out of sight. In the latter construction the molding forming the finish across the top of the frame is arranged to come off by means of screws, thus affording an opportunity for getting at the balance

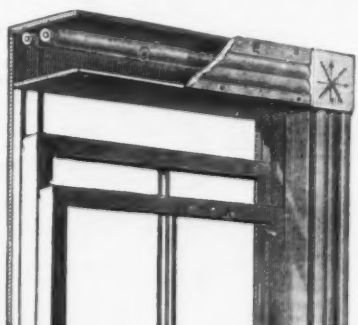


Fig. 3.—The Ormsby Sash Balance Applied to New Windows.

for adjusting it where adjustment is necessary. Where it is not desired to remove the face casing E, as shown in Fig. 3, the pocket may be arranged in the top jamb. Metallic bands attached to the pulleys of the balance extend down through holes in the top of the jamb and connect with the

made by which the balance may be adapted to windows of varying size. It may be increased 2 inches in length by drawing out the pulley P and inserting small screws through the cylinder. The arbor G is made of sufficient length to allow of this adjustment. When the full length of the balance is not needed the long end of the arbor is cut off to correspond with the opposite end. The company also manufacture, on this same principle, balances which are applicable to large doors, dumb waiters and other fixtures working in vertical grooves. The New York office of the company is Room 93, Tribune Building.

MANUFACTURING.

Iron and Steel.

The Miller Forge Co., of Pittsburgh, are forging a 25 inch iron shaft for the United States steamship Richmond.

Mr. S. P. Jewett, general manager of the Los Angeles and San Gabriel Valley Railroad, in California, was in Pittsburgh last week, and placed an order with the Pittsburgh Locomotive Works for a locomotive for his company's road. Several orders of the same kind will be placed in the future.

The Standard Iron Co. have been incorporated at Wheeling, W. Va., to manufacture iron and steel and to mine coal, by Alonzo Loring, Lewis Delaplaine, Daniel C. List, Jr., John T. Jones and Samuel P. Hildreth. The capital stock is not to exceed \$100,000.

The courts have been asked to have a receiver appointed to take charge of the affairs of the Himrod Furnace Co., of Youngstown, Ohio.

Carnegie Bros. & Co., of Pittsburgh, are busy filling an order for 20,000 tons of steel rails for the Union Pacific Railroad. The management are replacing the old track with new rails. They are also turning out an order of 600 tons of bridge iron for Galveston, Tex., and are busy making 1300 tons of structural iron for the State building at Denver.

Lucy Furnace No. 1, at Pittsburgh, which was blown out some time ago for the purpose of relining and making other repairs, will be blown in again the present week.

The Chicago Safe and Lock Co., of Chicago, report so many orders in hand that they are unable to take large orders at present. The company have added an area of 80 x 128 feet to their main floor space, making the same 80 x 320 feet in size. These extensive works front on both Canal and Clinton streets, and are turning out from 15 to 20 safes per day.

Nearly all of the machinery in the new steel works of Jones & Laughlins, Pittsburgh, is in place and has been satisfactorily tested. From present indications the works will be put in operation July 15, or not later than August 1. There are six new buildings, all made of structural iron manufactured by the firm.

The Union Steel Co., of Chicago, began rolling rails on the 11th inst. The other departments of the works are also in operation.

W. D. Wood & Co., of Pittsburgh, intend to add five new knobling furnaces to their mill at McKeesport, and will have them finished in five weeks. A new building will be erected for the new furnaces, which will employ 25 skilled workmen.

The employees of the Franktown blast furnace, operated by James Piorpoint, at Hollidaysburg, Pa., have been granted an advance of 10 per cent. in their wages.

Dilworth, Porter & Co., railroad spike manufacturers, of Pittsburgh, are shipping 500 tons of spikes to the Chicago, Minneapolis and Manitoba Railroad. They are shipped from Cleveland by lake to Duluth and then to Manitoba.

Cofrode & Saylor, bridge builders, of Pottstown, Pa., have been awarded the contract for the ironwork of the new Market street bridge, Philadelphia, by R. A. Malone & Son, of Lancaster, who were awarded the contract for the construction of the bridge at their bid, \$271,000.

Jones & Laughlins, of the American Iron Works, Pittsburgh, will at once rebuild their foundry, which was burned on the evening of the 12th inst. The new building will be fire-proof, and will be 210 feet in length and 104 feet wide.

Colebrook Furnace No. 2 (anthracite), in the Lower Susquehanna Valley will blow out in a few days for the purpose of relining and making other repairs.

The Aetna Iron Co., who are building a new furnace 12 miles beyond Centerville, Hickman County, Tenn., on the Nashville and Tusculocosa Railroad, are putting up 20 of the charcoal kilns patented by L. S. Goodrich, Warner, Ala. The Warner Iron Co. will probably remodel their 16 kilns to the same designs.

The Union Bridge Co. have received a small order for eye-bars for a bridge in Japan, which is being constructed by English builders. They competed with English firms on the price.

The contract for the great steel dome of the Lick Observatory on Mount Hamilton has been awarded to the Union Iron Works, of San Francisco, for \$58,850. The dome will be 76 feet in diameter. The iron plate on top of the brick will weigh 37 tons. The moving part of the dome will weigh about 90 tons with wall plate, 127 tons in all. The bid of the Union Iron Works was \$56,850 to construct and set up the dome complete.

At the Etna Iron Works, Newcastle, a second stage is just being completed. It is 78 feet high and 16-foot bosh. It is expected that it will blow in the beginning of next month.

All departments of the Pennsylvania Steel Works, at Steelton, Pa., were in full operation last week.

An iron casting weighing 5 tons was recently cast at the Amoskeag (Mass.) Foundry.

The blast furnace of the Cleveland Rolling Mill Co., at Newburgh, Ohio, which has just been rebuilt, will blow in soon.

Sloss Furnace No. 2, at Birmingham, Ala., which was blown out a few days ago, will be remodeled before it is blown in again. Mr. Fred. Sloss, the manager, will introduce some improvements of his own, and expects to have the best furnace in the South.

Work has begun on the substitution of a Whitwell Gordon plant for the pipe stoves of Alice Furnace No. 1, Birmingham, Ala.

The North Branch Steel Co., located at Danville, Pa., have bought out the business of Grove, Grier, & Co., Limited. They are making extensive improvements and additions to the works, and will enter into the manufacture of steel boiler-plates, ship and tank plate, steel forgings and steel washers, also rolled shapes, to which they devote special attention. Their office in Philadelphia will be at 330 Walnut street.

Machinery.

The New York Safety Steam Power Co., of New York, report the following recent sales through their Western office, 64 and 66 South Canal street Chicago: Courier-Journal Job Printing Co., Louisville, Ky., one 8-horse-power engine; Hayett & Smith Mfg. Co., Detroit, Mich., one 6-horse-power engine, one 3-horse-power engine; Singer Mfg. Co., one 6-horse-power engine and boiler; Fraser & Chalmers, one 8-horse-power engine, one 10-horse-power boiler; Bain & Turner, one 5-horse-power engine; Fort Wayne Jenney Electric Light Co., for Cheltenham Beach, South Chicago, two 12 x 12 horizontal automatic engines, one 9 x 12 horizontal automatic engine.

The Hooker-Colville Steam Pump Co., of St. Louis, Mo., are building a large miners' sinking pump for Denver, Col., and another for Quincy, Ill.

The Dustin Mfg. Co., Dexter, Me., recently shipped a large drilling machine to Syracuse, N. Y.

The Penobscot River Steam Boiler Works, Bangor, Me., find it necessary to increase their capacity.

The complete outfit of furniture machinery of the Union Furniture Co., of Batesville, Ind., has been supplied by the Egan Co., of Cincinnati, Ohio.

Richlé Brothers, of Philadelphia, Pa., have just completed a horizontal 200,000 pounds lever testing machine for a chain works at Columbus, Ohio.

The Boston and Albany shops, at Springfield, Mass., are at work on a new 20 x 20 inch freight locomotive.

The Refrigerator Ice Works, Jacksonville, Fla., have put in new machinery, increasing their daily capacity from 10 to 24 tons.

It is reported that John F. Stephens, of Rome, Ga., will establish boiler works at Birmingham, Ala.

The Mobile Electric Light Co., Mobile, Ala., will increase the capacity of their plant 50 per cent.

W. H. Smith, manufacturers' agent, of Pittsburgh, will remove to Chicago about July 15. Mr. Smith will represent the Abendroth & Root Mfg. Co., of New York City.

The Philadelphia water authorities on Tuesday awarded a contract for 4-inch stop-valves to the Southwark Foundry and Machine Co. The contract for five boilers at the Spring Garden Pumping Station and for two boilers at the Roxborough Pumping Station was awarded to I. P. Morris & Co. For one 20,000-gallon engine the bids are as follows: Wharton & Maxwell Co., \$85,000; William Cramp & Son, \$72,330; Holly Mfg. Co., \$69,000; Robert Wetherill & Co., \$67,000; H. R. Worthington & Co., \$57,000. No action was taken.

Hardware.

The Hartman Steel Co., Limited, of Beaver Falls, Pa., have begun the erection of extensive wash and bath rooms and a coffee-house or lunchroom combined for the use of their employees. It will be a handsome building and will be furnished with improved bathing facilities. The men will be charged a merely nominal sum for enjoying the bathing facilities, and will be furnished with a substantial lunch at all hours at a trifle over cost. When furnished the building will be turned over to the Hartman Mills Relief and Benefit Association, with the understanding that all profits arising therefrom shall go into the treasury of that institution, for its sole use and benefit. The upper story will be fitted up by the Hartman Co. and will be used as a meeting and reading rooms for the Relief Association. A coffee-house on a limited scale has been in operation at the works for 16 months past, and has proven so successful and so indispensable as to warrant the enlargement proposed in connection with the wash and bath rooms.

The Old Colony Shovel Works, at Taunton, Mass., are reported to be running to hours a day.

The North Wayne (Me.) Tool Co. intend to increase the capacity of their works by putting in new grinding machinery.

E. C. Atkins & Co., Indianapolis, Ind., are putting up a new building to be 66 x 102 feet, three stories, of iron and brick, and intended to be thoroughly fire proof. This is to contain their engine and boiler rooms and additional machinery made necessary by the rapid increase in their business. They refer to their trade this season as having been exceptionally large.

The Penfield Block Co., of Lockport, N. Y., report their truck department as running stronger than for years. An order for platform four-wheeled wagons and two-wheeled barrows from the new Erie Express is causing them to run overtime, with about double force.

The Triumph Wringer Co., Keene, N. H., have recently added 6000 feet to their floor space of factory room, and have increased their capacity of daily product to an output

of 600 finished wringers. In doing this they have put in some special and expensive machinery, rendering their factory, with this addition to their former facilities, especially well adapted for the manufacture of this line of goods.

The D. E. Whiton Machine Co., New London, Conn., have been organized as a joint-stock corporation, with D. E. Whiton as president and L. E. Whiton as secretary. They are to manufacture machinery and tools.

A number of the bolt-makers in some of the leading Philadelphia factories are out on strike, their demand for an advance in wages, ranging, it is said, from 20 per cent. to 40 per cent., not having been acceded to.

Miscellaneous.

Edward Kayl, manager of the Phoenix Glass Co.'s works, at Phillipsburg, Pa., proposes to form a co-operative company with a capital of \$30,000 to \$40,000 to operate the Doyle Glass House in that place. The Phoenix Co., who own the factory, will put it in as so much stock, while 25 to 50 glass blowers will invest as large a sum as possible, on which interest will be paid. The plan of co-operation proposed is that the blowers shall draw only a part of their wages weekly and let the balance stand. If at the end of six months or a year a profit can be paid it shall be done; if not, the outstanding wages are still to be withheld. Several staunch union men from Phillipsburg have joined the enterprise and it is intended to make it a union factory. The Phoenix Co. will do all the clerical work and make all the sales. The works are to be in operation by August 1, and will be supplied with natural gas by the Phillipsburg Gas Co.

The fourth convention of the Window Glass Workers' Association will be held in Pittsburgh on Tuesday, July 6, a full representation of delegates from American glass workers' assemblies being expected. President Isaac Cline will occupy the chair.

The following table, from the Marquette (Mich.) Mining Journal, exhibits in gross tons the total lake shipments of iron ore from the mines of the Marquette and Menominee ranges for the current season, up to and including Wednesday, the 16th, together with the shipments from the same ports for the corresponding period of last year:

Name of port.	1886.	1885.
Marquette	214,383	130,631
Escanaba	879,170	390,669
L'Anse	6,708	6,708
St. Ignace	14,496	19,950
	608,049	417,958

Gain over the shipments from the same ports for the corresponding period of last year, 190,096 gross tons. The shipments from the port of Two Harbors being about the same as at this date in 1885, there remains to be added to the above but the 112,418 tons already forwarded from the Gogebic mines (which had not begun shipping a year ago at this time) to give the gain over last season in the quantity of Lake Superior ore already sent to market by lake this season. The total foots up the handsome figure of 304,796 gross tons.

The trouble among the coke-workers in the Connellsville region has been satisfactorily settled. The following is the agreement entered into between the operators and the men: Sixty cents per each 100 bushels coal charged for drawing coke; car forking of 30,000 pounds and under, 95 cents; over 30,000 pounds, \$1.10. Day laborers to be paid 15 cents per hour; drivers, \$2 per day; slope and shaft drivers, \$2.10 per day. All track cleaning and wheeling of ashes to be done by the laborers of the company. The regular monthly meeting of the syndicate was held in Pittsburgh on the 18th inst. It was thought that on account of the coke-workers receiving an advance of about 8 per cent. in wages the price of coke would also be advanced, but, contrary to expectations, no advance over present prices was made.

A very heavy flow of gas has been struck in a well at the Moore farm, 1 mile from Grapeville, Pa.

The Brown Hoisting and Conveying Machine Co., of Cleveland, Ohio, have received an order for a plant at Fairport, Ohio, to consist of nine bridge trams of 180 feet span each, fully equipped for handling ore and coal. The plant, when completed, will be capable of handling from 6000 to 7500 tons a day of 10 hours.

E. H. Cottrell, of C. B. Cottrell & Sons, manufacturers of printing presses, at Westbury, R. I., has been in Pittsburgh, inquiring into the methods of using gas in forging. He proposes to adopt the use of gas made from naphtha oil, as it makes cleaner forgings than coal, and will base his system on that adopted in using natural gas in Pittsburgh. The Government armory at Springfield, Mass., is the only place in this country where this kind of gas is used, but Mr. Cottrell proposes to improve on the method in use there by spraying the oil as a vapor into the air as the latter is blown into the furnace.

A big swinging derrick on the Public Buildings tower, in Philadelphia, has reached a height exceeding 300 feet. To elevate the derrick and the engine which accompanies it there are employed four powerful iron screws, 46 feet long and 4 inches in diameter each, upon which the swinging superstructure rests, and which are firmly secured in the brickwork of the tower.

The new iron steamer Newburg, built by Neff & Leary for Ramsdell's line, on the Hudson River, made her first trip on Monday, running 17 miles an hour with ease under 60 pounds of steam. The following are her dimensions: Length, 210 feet; breadth of beam, 32 feet; depth of hull, 11 feet. She is run by a vertical surface compound engine of 26 inches high pressure and 45 inches low pressure, with a 3-foot stroke, and is fitted with a propeller-wheel 10 feet in diameter, having a 15-foot pitch.

The steamer has two boilers, each 9 feet 6 inches in diameter and 20 feet long. Her machinery is from the Penn Works.

WASHINGTON NEWS.

(From Our Regular Correspondent.)

WASHINGTON, D. C., June 22, 1886.

On Thursday, June 17, according to previously announced programme, Wm. R. Morrison, chairman of the Committee on Ways and Means, moved to go into committee on the whole for the consideration of revenue bills—his bill "to reduce tariff taxes." As the motion was not debatable the House proceeded at once to vote. The result was not a complete surprise to Mr. Morrison, as he expected the motion to be defeated by four or five, but when he discovered that there was a majority of 17—years 140, nays 157—against him he began to realize that tariff revision in the direction of free trade was not popular in the Forty-ninth Congress. The total number present, being 297 out of a possible 325, indicates the exceptional interest taken in the question, even the Speaker voting. Of the 28 not voting, with the exception of one Democrat for whom a pair could not be found and one vacant seat, every vote was paired. In the affirmative vote there were 136 Democrats and 4 Republicans, and in the negative 122 Republicans and 35 Democrats.

A CHANGE OF PLANS.

At a caucus of Democrats who voted for consideration, held last night at the Capitol, Mr. Morrison opened the proceedings by making a brief speech, in which he manifested a very positive inclination to haul off from the tariff controversy. It was finally decided to permit him to exercise his own judgment in the matter of repeating the motion to go into committee of the whole whenever it suited him. This means that he will not trifle with the tariff bill any more this session. It was proposed as a substitute for the motion to go into committee of the whole to issue a *pronunciamiento* declaring the views of the parties who stood by Mr. Morrison in this free-trade movement, and for that purpose a committee of co-operation and consultation, to consist of one from each State having a Democratic advocate of the doctrine of the bill, was to be appointed.

THE PLANS OF THE PROTECTION DEMOCRATS.

The change of plans of the free-trade wing of the majority in the House will necessitate a change of programme on the part of Mr. Randall and his friends. The gentlemen had a very carefully-prepared bill which it was their intention to move as a substitute for the Morrison bill in committee of the whole. In order to carry out this plan it would simply have been necessary for a portion of the 35 Democratic votes against consideration to refrain from voting in order to allow the Morrison bill to be taken up for discussion, so as to get their bill in. Now that the free traders have become stampeded and have decided not to try their chances again in that shape, as there was no sign of a change of a single vote and rather a danger of an increased support on the other side, it will be necessary for Mr. Randall and his friends to introduce their bill and have it referred. It will then be possible to move to discharge the committee and take up the bill in parliamentary form. A conference will be held on the plan now to be pursued. As the free-trade ring have abandoned their position and propose to appeal to the country in an address, Mr. Randall and friends propose to appeal to the country in a bill to raise and adjust duties where necessary. Among the articles proposed to be raised are tin plate and iron beams, and reduced steel rails.

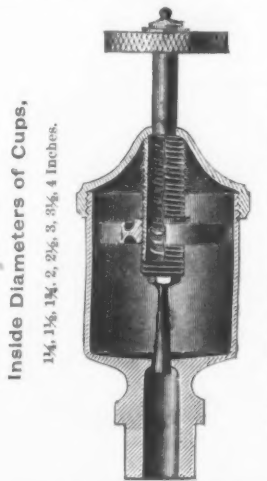
India-rubber is menaced with a rival. The rubber dealers of Eastern Nicaragua think they have discovered a tree whose gum will give as much satisfaction as rubber, and will, in fact, take its place. They say that the milk of the *tuno* furnishes a most excellent gutta-percha, equal to the best found in the Eastern tropics, while the number of trees is virtually inexhaustible, and the gum can be produced with profit at 12 cents a pound.

CONTENTS.

	PAGE.
The Estrade High-Speed Locomotive. Illustrated.	1
The Bursting of Fly-Wheels.	1
Structure of Steel.	1
The Effect of Frost on Different Roadways.	5
Ordnance Supplies.	9
English Letter.	11
American versus English Bridge-Building.	11
The Record of the Spring Lake Charcoal Furnace.	13
A New Iron Enterprise in South Russia.	13
Foreign Markets.	13
Editorial:	
The French Drawback System.	14
Limited Partnerships.	14
English Exports to the United States.	14
Tariff Revision.	15
The Week.	15
The Iron Age Directory.	17
Trade Report:	
British Iron and Metal Markets.	19
Financial.	19
Metal Market.	19
New York Metal Exchange.	19
Exports.	19
New York.	20
Philadelphia.	20
Pittsburgh.	20
Chicago.	20
Birmingham.	21
Chattanooga.	21
Cincinnati.	21
Louisville.	21
St. Louis.	21
Detroit.	21
Coal Market.	21
General Hardware.	22
Cutlery Manufacture at Solingen, Germany.	22
Steel and Iron-Making in Belgium.	22
The First Rail Rolled in Italy.	23
Construction and Testing of Air-locks and Shaft-Tubes.	23
Damascening by Electrolysis.	23
The Solidification of Oxygen.	23
Mechanical:	
Lost Energy.	25
New Resawing and Band-Saw Machine. Illustrated.	25
The Corrosion of Boilers.	25
The Ballantine Automatic Grease Cup. Illustrated.	25
An Electric Traveling Crane.	25
Gumming Saws.	25
A Novel Chimney Staging. Illustrated.	25
Current Hardware Prices.	26
Wholesale Metal Prices.	26
Hardware Novelties:	
The Perfection Postal Scale. Illustrated.	29
Diamond Trammels. Illustrated.	29

Pratt's Multifore Screw Driver. Illustrated.	29
New Sash Pivot. Illustrated.	29
Ormsby Sash Balance. Illustrated.	29
Manufacturing:	
Iron and Steel.	29
Machinery.	29
Hardware.	29
Miscellaneous.	30
Washington News.	30
Scientific and Technical:	
Thermometers for White Heat.	31
Practical Manufacture of Hydrogen Gas.	31
Earth Currents.	31
The New Metal Germanium.	31
Imports.	31
Philadelphia and Pittsburgh Hardware and Metal Prices.	39
Boston Hardware and Metal Prices.	40

THE BALLANTINE Patent Automatic Grease Cup.



MANUFACTURED BY THE

WALKER MFG. CO.,
CLEVELAND, OHIO.

PAYSON'S STEEL Transom Lifter.
Self-Locking.

Only one style of Lifter in each size for transoms hung at top, centre or bottom. Locking device in plain sight and operated with one hand.

No danger of heavy Transoms dropping and breaking glass.

Send for our new Catalogue.

Payson Mfg. Co.,
Chicago.

EASTERN OFFICE:
H. J. BRAINERD,
97 Chambers Street,
NEW YORK.

BUCKEYE JUNIOR LAWN MOWER
Made in four sizes: 10, 12, 14, and 16-inch cut.
Most reliable Mower in use. Easy to work, strong and durable.

Also manufacturers of the Buckeye Hose Reel and Lawn Sprinkler, Iron Turbine Wind Engines, Buckeye Force Pumps and Buckeye Iron Fencing. Send for Illustrated Circulars to **MAST, FOOS & CO.,** Springfield, O.



"Challenge" Fire Hose Carriage

Holds from 500 to 800 feet of 2 1/2-inch Hose; 44-inch Wheels; Patent Swing Tool Box; no weight on handles; nickel-plated trimmings; light and easily handled. Price, including 300 feet best quality 2 1/2-inch Linen Hose, coupled, \$100.

EDWARD H. JACOBS & CO., Mfrs., Danielsonville, Conn.

THE Dangler Furnace.

The only Vapor Furnace that has proven an absolute success for bench and outdoor use. The Dangler Combination Furnace can now be seen and bought in all the leading cities and towns throughout the United States. For further information address

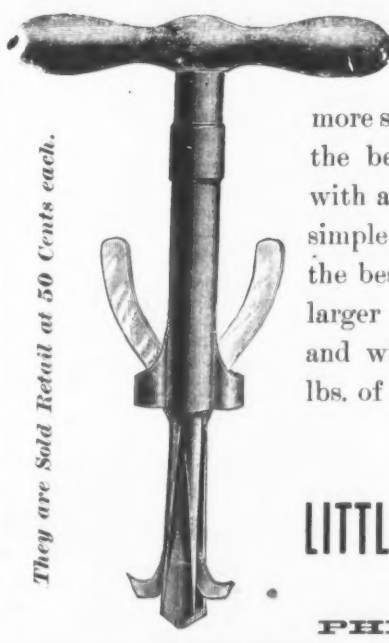
The Dangler Vapor Stove & Mfg. Co.,
Cleveland, Ohio, and Chicago, Ill.

BUFFALO SCALE CO.,
BUFFALO, N. Y.

Manufacturers of
R. R. Track Scales, Hay Scales, Coal Scales, Grain Scales, Platform Scales, Counter Scales, &c.
Send for price list, stating what you want.

THE "LITTLE GIANT ICE GRIP."

A TOOL FOR HANDLING ICE,



They are Sold Retail at 50 Cents each.

taking the place of the old-style tongs, performing the work much more satisfactorily. Manufactured from the best quality of steel, hand forged, with an enamel finish handle; are very simple in construction, and are made in the best manner. The tool is one-third larger in size than represented by cut, and will handle readily from 50 to 75 lbs. of ice.

For Price List and Terms address

LITTLE GIANT ICE GRIP CO.,

531 Commerce Street,

PHILADELPHIA, PA.



STEAM JET CHIMNEY VENTILATOR,

For Increasing Draught in Chimneys.

The draught area of any Chimney should always be of sufficient capacity to remove the products of combustion, whether a Blower is attached under furnace or not, and if there is not sufficient space in the Chimney, then some means must be provided to improve the draught and remedy the defect.

This Ventilator accomplishes the purpose by placing the machine inside the chimney flue, as shown in cut, supported by a cross bar, with a steam-pipe connected, direct from dome of Boiler. Excellent results are being obtained by numerous parties who have these machines in use.

They are also made of Lead for removing Gas Fumes from furnaces

AMOS ALLER,

109 Liberty Street, New York.

THE NEW YORK SUPPLY CO., LIMITED,



RAILWAY, MACHINISTS', ENGINEERS', MILL AND MINERS' SUPPLIES,

50-52 JOHN ST., NEW YORK.

Exclusive New York Agents for The Lowell Wrench Co.



J. F. Wollensak
CHICAGO, ILL.

SMALL CASTINGS.
WARRANTED SOFT, CLEAN, SMOOTH.
LOW PRICES.

LARGE CONTRACTS.

Springfield Foundry Co. 93 LIBERTY ST. Springfield, Mass.



A Perfect Dust Pan at Last.

THE STEEL EDGE DUST PAN CO.,
Manufacturers,
6 Exchange Place, Boston, Mass.

Samuel Martin,
MANUFACTURER OF
Theatrical Hardware,
127 Eighth Avenue, New York.

WRENCH.

ADAMS' Countersink, STICKNEY'S Bradawl.

Perkins' DOOR CHECK, HOME GRINDLES AND Hardware Specialties.

This is the most convenient and durable Wrench ever invented. "Always ready" for use; needs no adjusting; fits nuts from 1/4 to 3 inches. Forged steel, tempered in oil, polished and nickel plated. Sold by all Hardware dealers.

Portsmouth Wrench Co., 151 Congress St., Boston, Mass.

ORE JIGS.

The attention of Hematite ore miners is called to our new Jig. The simplest and most effective separator now in use.

McLANAHAN & STONE,
Gaysport Foundry, Hollidaysburg, Pa.

Manufacturers of Ore Washers, Screens, Elevators, Conveyors, any general Ore Mining Machinery.

GALLOWAY BOILER

IMPROVED UNDER PATENTS OF 1875 AND 1876.

Safety Economy in Fuel, Low Cost of Maintenance, Dry Steam without Superheating, Large Reserve Power,

ARE THE ADVANTAGES OFFERED BY THIS BOILER IN A PRE-EMINENT DEGREE.

3000 Horse-Power in Progress and for Immediate Delivery. Correspondence Solicited.

EDGE MOOR IRON COMPANY,

SOLE LICENSEE AND MANUFACTURER FOR THE UNITED STATES,

POST OFFICE, WILMINGTON, DELAWARE.

Philadelphia Office, 1600 HAMILTON STREET. - - - New York Office, 79 LIBERTY STREET.

WM. SELLERS, Pres. JNO. SELLERS, JR., Vice-Pres. ELI GARRETT, Sec. and Treas. GEO. H. SELLERS, Gen. Supt.



NEW PLATFORM FREEZER.

Sizes: 15, 20 and 25 Quarts.

Just the Thing for Hotels, Restaurants and Saloons.

THE TRIPLE MOTION WHITE MOUNTAIN Ice Cream Freezer

STANDS AT THE HEAD in point of mechanical construction, simplicity of operation, durability, and, above all, excellence of production.

The only Freezer ever made having three distinct motions, thereby producing finer, smoother Cream than any other Freezer on the market. Acknowledged by every one to be the best in the world. Over 300,000 in use to-day.

Outside Irons Galvanized, but all inside the can coated with Pure Black Tin.

Tubs waterproof. Packing Tubs and Packing Cans all sizes. Wholesale and Retail.

For illustrated catalogue, price list and trade discounts address the manufacturers,



HAND FREEZER.

Ready to Operate.
Sizes: 2, 3, 4, 6, 8, 10, 15, 20, 25 and 50 Quarts.

WHITE MOUNTAIN FREEZER CO., Nashua, N. H.

MANUFACTURERS OF AND DEALERS IN ALL KINDS OF

FOUNDRY-FACINGS

PLUMBAGO OR BLACK LEAD

For All Purposes.

ALSO SHIPPERS OF THE CELEBRATED

CINCINNATI MOLDING SANDS

For Stove Plate, Heavy and Light Machinery, Agricultural and Brass Work.

Agents for MONK'S CELEBRATED MOLDERS' TOOLS.

Send for Illustrated Catalogue and Price List. No charge for Samples.

EAGLE

THE LARGEST FACING MILLS IN THE WORLD. Capacity, 650 Barrels Per Day.

FOUNDRY-SUPPLIES

MILLS HEAVY MACHINERY AND FINE STOVE PLATE FACINGS

A Specialty.

S. OBERMAYER FOUNDRY SUPPLY MFG. CO., CINCINNATI, OHIO.

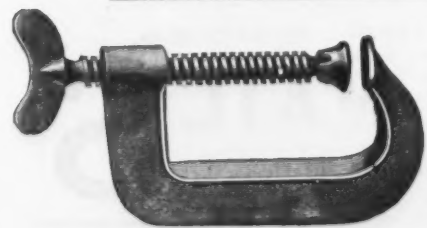
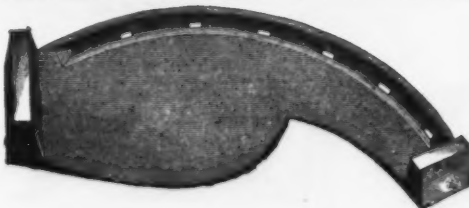
Mount Carmel Ox Shoes,

WITH STEEL TOE CALKS.

The Best and Cheapest Shoes Made.

Warranted to Outwear Any Other Shoe.

Six Sizes Each. Blunt and Sharp Calk.



Eagle Screw Clamps,

WITH

BALL and SOCKET SWIVEL.

Ten Sizes. To Open.

2, 2 1/2, 3, 4, 5, 6, 7, 8, 10, 12 Inches.

Coach & Carriage Hardware & Fine Mountings

Malleable Iron and Brass Castings.

Correspondence solicited.

WOODRUFF, MILLER & CO., Mfrs., Mount Carmel, Conn., U. S. A.



DYNAMITE

FOR ALL KINDS OF BLASTING

CAPS, FUSE

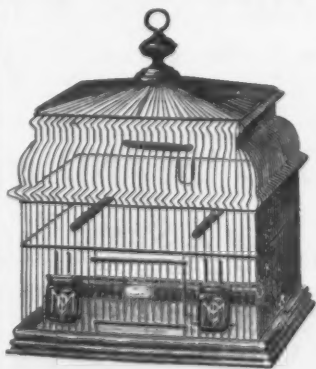
AND ALL

BLASTING SUPPLIES.

Write for Illustrated Pamphlet. Mailed free Agents wanted.

AETNA POWDER CO.,

98 Lake St., Chicago.



The Original Inventors and Manufacturers of the

"OSBORN"

Bright Metal Cages, in Brass, Bronze and Silver Plate.

NEW AND BEAUTIFUL DESIGNS JUST OUT.

We also Manufacture Brass and Bronze Show Stands for Fancy Goods. Catalogues Mailed Free.

SCIENTIFIC AND TECHNICAL.

Thermometers for White Heat.

Messrs. Heisch and Folkard have devised some new thermometers with platinum or porcelain bulbs, by which very high temperatures, even those of a white heat, can be measured without having to resort to an expensive or troublesome pyrometer. The reading is taken in precisely the same way as at present with an ordinary thermometer, but the result is obtained by the pressure of air inclosed in the bulb, which is exposed to the heat. This pressure acts directly on a vertical column of mercury. The bulb is hermetically sealed, and the instrument is unaffected by changes in the height of the barometer.

Practical Manufacture of Hydrogen Gas.

A novel method, invented by MM. Felix Hembert and Henry, of manufacturing hydrogen gas on a large scale, has been briefly described by them in a communication to the French Academy of Sciences. In a retort superheated steam in fine jets is passed over coke in the state of incandescence. The gas mixture generated, which consists of equal volumes of hydrogen and carbonic oxide, is made to circulate in a second retort, also heated to a red glow, containing obstacles of a refractory material, so that the gases are well mixed and heated. At the same time more steam heated to the point of dissociation is admitted into this retort. The theory requires an excess of water vapor to insure the complete oxidation of carbonic oxide, the gases decomposed forming carbonic acid (carbon dioxide) and hydrogen gas. It is claimed that 3200 c. m. of hydrogen gas can be obtained per ton of coke, at a cost of 0.015 franc per cubic meter, equivalent to approximately 1/10 penny per cubic yard. When M. Fages first made hydrogen out of coal and water he could furnish hydrogen gas at 0.044 franc a cubic meter.

Earth Currents.

At a recent meeting of the Berlin Meteorological Society, Dr. Weinstein spoke on the earth's currents which were observable in the telegraph wires by the disturbances they caused in the message service, their intensity at times exceeding that of the batteries of So Daniell employed for telegraphing. In order to the observation of the earth's currents, two equal metal plates had since the time of Faraday been sunk into the ground and connected by a wire, in which a galvanometer was intercalated. The deviations of the galvanometer needle might be induced as well by an earth current as by a current which arose from the contact of the earth plates with the earth. In the latter case, however, the current would be very weak when the plates were at a great distance from each other. The case being in point of fact otherwise, however, the currents in question were accordingly earth currents. The measurements of them were achieved by means of self-registering apparatus, either in the way of photography in England or mechanically in Germany; the earth current was conducted through a coil that, suspended in the interval between a rod magnet and a hollow cylinder magnet, was, under the oscillations of the current, drawn in or pushed out, and by means of a lever inscribed these movements on soot-blackened paper.

The direction of the current in the body of the earth was found by observation of two circuits forming a right angle with each other. In Berlin one circuit proceeded eastward toward Thorn, the other southward toward Dresden. The observations made in Berlin showed a direction of the earth's current from northeast to southwest, while in England the direction went more from north to south, with a slight deviation toward the east, and in France a direction from north to south, with an inclination toward the west, was observed. The earth current showed a perfectly regular daily variation. In the night the earth current is slight; from 5 o'clock in the morning it regularly increases, attains its maximum precisely at 12 noon, thence sinks rapidly till 4 p. m., whence it continues uniformly weak, not to revive till the following morning. A course precisely analogous to that of the earth current was manifested by the earth's magnetism, the connection of which with the electricity of the earth attracted attention from the very beginning, when disturbances made themselves observable.

To demonstrate with perfect precision the coincidence of the two phenomena, it was necessary to take for the purpose of comparison, not a single earth magnetic element, but the earth's total magnetism. The earth's electricity and the earth's magnetism showed, moreover, in their regular daily course their affinity by the simultaneity with which their disturbances occurred. This simultaneity was so precise that in one case the distance between Berlin and Wilhelmshaven could be determined from the time when the disturbance of the earth's current made itself felt in Berlin and the time when the magnetic disturbance occurred in Wilhelmshaven. This simultaneity of disturbances at distant points of the earth pointed to a cosmical cause. Thus in August last year, at the very time when in Paris the emergence of an altogether unusual solar protuberance was observed, a magnetic disturbance was registered in Petersburg, and a disturbance of the earth's current in Berlin. The earth's current and the earth's magnetism showed further in common the periods of 11 years which coincided with those of the solar spots. In respect of the earth's current this period could not indeed be demonstrated to a certainty, seeing that the regular observations made respecting it were yet of too recent date, but the regular course of the oscillations warranted the conclusion of a like period being drawn. A period of from two to five days, in which the earth's current and the earth's magnetism showed in their oscillations alternately larger and smaller amplitudes, had, in addition, been detected, although the explanation of the phenomenon was not yet forthcoming.

With reference to the question which phenomenon was the primary, the earth's current or the earth's magnetism, opposite views were entertained. The earth's electricity was assuredly not strong enough to

magnetize the body of the earth, but, on the other hand, against the assumption that the earth's currents were induced by the oscillations of the earth's magnetism, an objection might be raised, namely, that in such a case the earth's currents would have to be proportional to the velocities of the oscillations of the earth's magnetism, and not to the oscillations themselves. This question can only be decided by further observations and by experiment. In a wide circle of telegraph circuits the induction effects of the earth's magnetism might be studied and compared with the earth's currents. The speaker discussed the different theories of the earth's electricity set forth by Faraday, De la Rive, Lamont, Elund and the brothers William and Werner Siemens, without declaring himself decidedly in favor of any of them. In conclusion he drew attention to the series of different jerks which showed themselves in the self-registering curve of the earth's currents on the occasion of every thunder storm. A jerk of this description on the part of the pointer seemed to correspond with each lightning flash.

The New Metal Germanium.

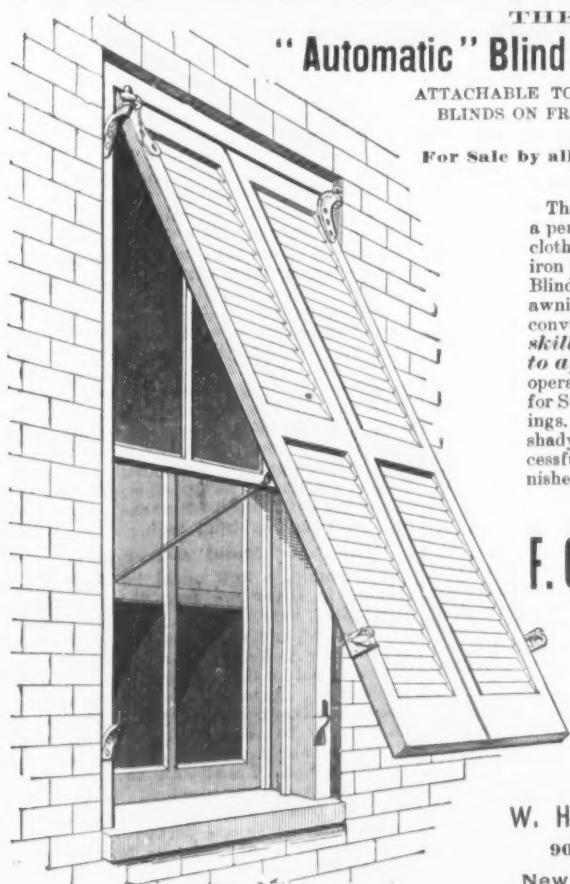
Germanium, a new metal, has been discovered in silver ore from the Himmelsfuerst Mine, near Freiberg. This ore, called it silver, sulphur and a small quantity of by Professor A. Weisbach "argyrodite," was examined before the blow-pipe, who found in quicksilver. Later more complete analyses made the silver contents 73 to 75 per cent.; sulphur, 17 to 18, with 0.21 mercury, a little iron and traces of arsenic. By ordinary methods of analysis 6 to 9 per cent. always escaped determination, and Clemens Winkler finally succeeded in separating germanium, which may occupy the place in Mendeleeff's scale between bismuth and antimony.

Imports.

The following were the Imports of Hardware, Iron, Steel and Metals into the Port of New York for the week ending June 23, 1886:

Hardware.	Quantity.	Value.
Aufmordt C. A. & Co. Mach'y, pkgs., 22		
Barbour Bros. Mach'y, cs., 24		
Baker Hermann & Co. Cutlery, cs., 9		
Brown Bros. Pkgs., 88		
Clark Geo. A. & Bro. Mach'y, cs., 302		
Dieckhoff, Rafflor & Co. Cases, 10		
Downing R. F. & Co. Cases, 8		
Dolge Alfred, Mds., cs., 4		
Folsom H. & D. Arms, cs., 12		
Fougera T. F. Safety-valves, 2		
Field Alfred & Co. Chains, cs., 20		
Guns, cs., 2		
Hawley E. Ironware, cs., 4		
Hermann Theo. Old mach'y, case 1		
Hernshelmer L. Mach'y, case, 1		
Hartley & Graham, Guns, cs., 24		
Jackson R. D. Mach'y, cs., 6		
Johnson John & Co. Mach'y, pkgs., 63		
Kreig F. M. & Co. Sew. ma., cs., 14		
McCoy & Sanders, Cases, 2		
Moore & Son J. P. Arms, cs., 3		
Shoverling, Daly & Gales, Mds., cs., 7		
Schlous & Son, Machines, cs., 8		
Schutte Wm. & Co. Cases, 6		
Sheldon Geo. W. & Co. Cases, 15		
Wiebusch & Hilger, Pkgs., 17		
Arms, cs., 14		
Cases, 4		
Cases, 2		
Witte John G. & Bro. Cutlery, cs., 8		
Order.		
Mach'y, pkgs., 14		
Pkgs., 11		
Mach'y, box, 1		
Pump chains, box, 1		
Iron.		
Barling Bros. & Co. Rivet rods, coils, 1042		
Ore, kg., 45,000		
Bundles, 1390		
Bars, 1597		
Broekner & Evans, Wire net g. rolls, 236		
Crocker Bros. Fig. tons, 500		
Spiegel, tons, 217		
Greely R. S. Wire coils, 201		
Herbet Bros. Box, 1		
Lazard Freres, Rods, coils, 4312		
Longhold G. F. Bundle, 1		
Order.		
Quantity.	Value.	
Brass goods, 47	\$3,245	
Bronzes, 13	1,411	
Chain and anchors, 27	1,301	
Clocks, 17	981	
Copper, 66		
Cutlery, 81	33,949	
Dutch metal, 13	1,910	
Guns, 203	22,063	
Hardware, 7	1,701	
Iron, pig, tons, 3,130	32,605	
Iron, sheet, tons, 32	1,714	
Iron, spiegel, tons, 2,114	48,947	
Iron ore, tons, 314	265	
Iron, other, tons, 886	16,306	
Lead, pigs, 951	3,065	
Machinery, 382	21,576	
Metal goods, 312	29,085	
Nails, 5	561	
Needles, 18	3,689	
Nickel, 3	656	
Old metal, 3	10,436	
Plated ware, 21	1,222	
Quicksilver, 350	10,547	
Regulus antimony, 30	1,629	
Saddlery, 64,396	76,176	
Spelter, lb., 44,052	1,371	
Type metal, 4	4,527	
Tin, bxs., 62,113	240,652	
Tin, 5,005 slabs; 545,364 lb.	128,194	
Wire, 87	3,574	
Zinc oxide, 185	1,359	

The large, elegant hardware store of R. J. Trevor, in Decatur, Ind., was blown to pieces on the 20th inst. as supposed by an explosion of benzine. The loss is estimated at \$15,000.



THE "Automatic" Blind Awning Fixture.

ATTACHABLE TO OLD AS WELL AS NEW
BLINDS ON FRAME OR BRICK HOUSES.

For Sale by all the Hardware Trade.

The very best Blind Hinge and a perfect Awning Fixture. No cloth to tear and wear out. No iron frames to shake and rattle. Blinds instantly converted to awnings. Awnings instantly converted to blinds. *No skilled labor necessary to apply them.* A child can operate them. Indispensable for Summer Hotels and Dwellings. Rooms always cool and shady. Many thousands in successful operation. Models furnished to architects.

F. O. NORTH & CO.

SOLE
MANUFACTURERS,
**BOSTON,
MASS.**

W. H. JACOBUS & CO.,
90 CHAMBERS ST.,
New York Warehouse.

THE SALEM WIRE NAIL CO.,

SALEM, OHIO,

—MANUFACTURERS OF—

WIRE and WIRE NAILS.



AGENTS:

ELY & WILLIAMS,
New York
and
Philadelphia, Pa.

F. K. BOWES,
Chicago, Ill.
JNO. H. HEIMBUCHER,
St. Louis, Mo.

J. B. MECKLENBORG,
Cincinnati, Ohio.
W. U. WALKER CLAY MFG. CO.,
Pittsburgh, Pa.

TOWER'S (Donohue's Patent) ENGINEER'S WRENCH.

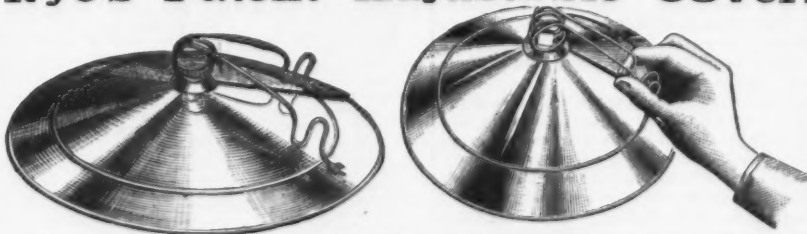
10, 12 AND 15 INCH.



Combined Nut and Pipe Wrench. The
Strongest Wrench Made.

TOWER & LYON, 95 Chambers Street, NEW YORK, U. S. A.

Nye's Patent Adjustable Cover.



One 10 and one 12 inch cover will fit tight every sized opening from 8 to 12 inches.
THE BEST SELLING ARTICLE OF TINWARE EVER OFFERED.

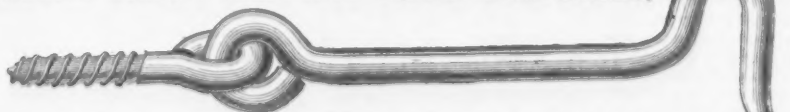
FOR PRICES ADDRESS

TOPLIFF & ELY, Elyria, Ohio, Sole Manufacturers.

M. S. BROOKS,

Chester, Conn. Original Manufacturer of

BROOKS' BRIGHT IRON AND BRASS WIRE GOODS.



Also Bright Wire Goods for Cotton and Woolen Mills. Wire straightened, cut, milled and bent into any shape, with or without thread. Write for prices on anything made of wire.

Established 1848.

M. S. BROOKS, Chester, Conn.



CORTLAND ADJUSTABLE S WRENCHES.
The Best Mechanist's Wrench in the World.

**The Ross & Fuller
Association,**

33 Chambers Street,
NEW YORK,

SOLE AGENTS.

WESTERN FILES.

WESTERN FILE CO., Limited,

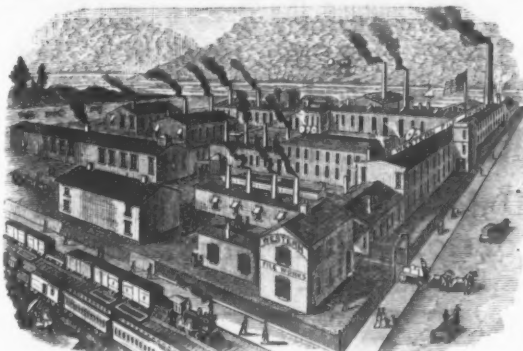
BEAVER FALLS, PA.

ESTABLISHED 1869.

Capacity,

1200 Doz.

per Day.



Every

File

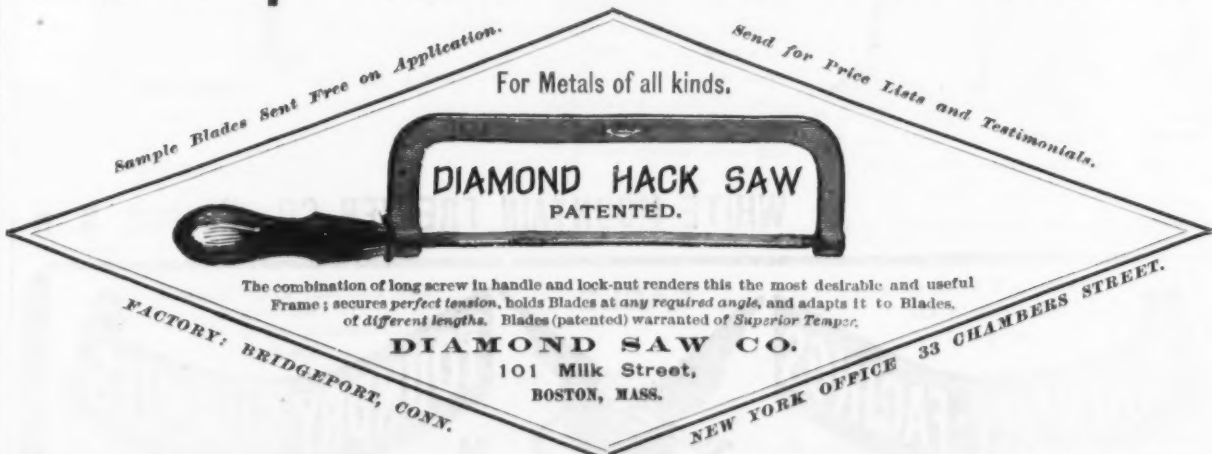
Warranted.

Files and Rasps of Every Description.

THE BEST IN THE MARKET.

WRITE FOR CATALOGUE AND PRICES.

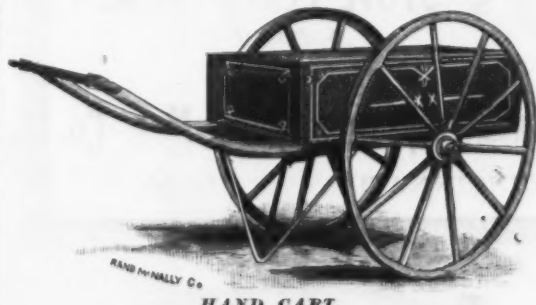
An Improvement in Hack Saws.



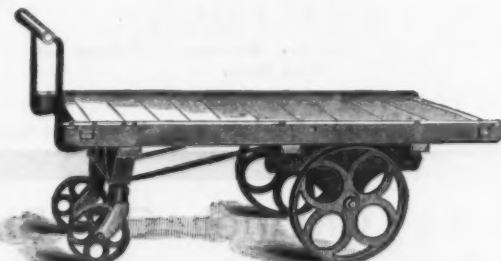
The advantages claimed over all others for these PATENT TOOTH Blades are that they NEVER BIND and will OUTWEAR other saws.

LANSING WHEELBARROW CO.,

Lansing, Mich.



HAND CART.



THE REYNOLDS IMPROVED TRUCK.

Front Wheels Casters. Truck turns in its own length. Runs on or off elevator or scales at any angle. Is easily dumped by lifting handle. Any size. Send for circular.

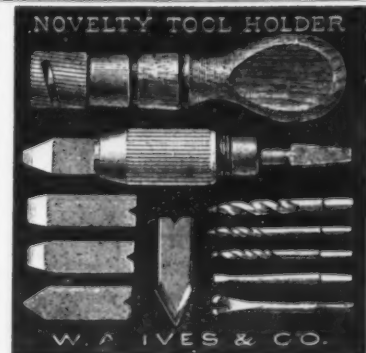


Globe Patent Garden Barrow.



Capitol Patent Bolted Barrow.

SEND FOR CATALOGUE.



NOVELTY TOOL HOLDER

The ACME SHEAR CO.

Bridgeport, Conn., U. S. A.,
Manufacturers of
CAST SHEARS.
The Best and Cheapest in the market. Lamp Trimmers, Lemon Squeezers, Ice Picks and Tongues, Nut Crackers &c. Send for price list of specialties.

SAYRE PIPE FOUNDRY,

MANUFACTURERS OF

Cast Iron Pipe and Special Castings for Water and Gas,

SAYRE, PA.

Established 1830.

THE PLYMOUTH MILLS.

Rivets Trunk Nails
Tacks, Clout Nails,
Burr, Wire Nails.
PLYMOUTH, MASS.

RIVERSIDE IRON WORKS,

MANUFACTURERS OF RIVERSIDE

STEEL NAILS

Fig Iron, Bar Iron, Bar Steel, Steel Blooms, Steel Billets,
Small T Nails, Flat Rails of Iron or Steel, Fish Bars of Iron or Steel.

WHEELING, W. VA.



HUGUNIN Improved Adjustable SASH BALANCES, Mechanical Substitute for Weights, 3 Sizes.

Sashes work with weights. No clock springs, latches, or attachments to the Sash. No. 1, 1 1/2 in. wide, \$1.00 per set; No. 2, 1 1/4 do. 80c. do.; No. 3, 1 1/2 do. 60c. do. Gray Iron, screws included. Malleable, No. 1, \$1.25; No. 2, \$1.00; No. 3, 80c. per set. Plain, Hard Bronze finish, 10% extra. *Robt. B. Hugunin, Inventor and Sole Authorized Maker, is cast on the face-plate of the genuine improved goods. The unimproved No. 2's have been fraudulently copied, with date of my minor patent, Nov. 5, 1877—never used on the genuine. I still sell this at half price. The improved are made under the care of the inventor and are warranted to give satisfaction. Sample sets mailed on receipt of list price only. Factory discounts on all orders addressed to* ROBT. B. HUGUNIN, Hartford, Conn., U. S. A.

AMERICAN BOLT COMPANY,

Manufacturers of

BOLTS AND NUTS, COACH OR LAG SCREWS,

Bridge Bolts, Car Bolts, Track Bolts, Washers, Chain Links, BUILDING BOLTS

AND IRONS OF ALL KINDS, Forgings, Bolt and Nut Machinery, &c.

JAMES MINTER, President.

LOWELL, MASS.

MILES F. BRENNAN, Treasurer.

RHODE ISLAND HORSE SHOE CO.,

MANUFACTURERS OF

Horse, Mule & Snow Shoes of the Perkins Pattern.

Works at Valley Falls, R. I.

Office, 31 Exchange Place, Providence, R. I.

F. W. CARPENTER, President.

C. H. PERKINS, Gen'l Manager.

R. W. COMSTOCK, Secretary.

GREENE, TWEED & CO.,

—MANUFACTURERS AND IMPORTERS OF—

Railroad, Mill and Manufacturers' Supplies,

83 Chambers Street, - - New York.

"PENNSYLVANIA."

We defy any one to produce its equal. The Pennsylvania Lawn Mower Works have now in their possession a 16-inch Pennsylvania Mower which was sold to an institute in this State, which was used nearly every working day constantly from the day it was purchased until they got it in their possession. This mower cut 500 acres of grass, was sharpened but once during use, and, although it has not been sharpened since it came from the ground, nevertheless will cut the finest paper.

1886 PENNSYLVANIA LAWN MOWER.

Has No Equal,

Surpassing All Others

AND PRONOUNCED

"THE BEST."

Illustrated Price Lists sent upon application.

Please write for same to
 LLOYD & SUPPLEE HARDWARE CO., Phila.
 J. C. McCARTY & CO., New York.
 AMES FLOW CO., Boston, Mass.
 SIMMONS HARDWARE CO., St. Louis, Mo.
 HAMILTON & MATHEWS, Rochester, N. Y.
 HARKLEY & ALLING & CO., Chicago, Ill.
 LOGAN, GRIGG & CO., Pittsburgh, Pa.
 JANNEY, SEMPLE & CO., Minneapolis, Minn.
 HUNTINGTON, HOPKINS & CO., San Francisco and
 Sacramento, Cal.
 POSTER, STEVENS & CO., Grand Rapids, Mich.
 GEO. TRITCH HDW. CO., Denver, Col.
 WOODHOUSE, WELLS & CO., Decatur, Ill.
 A. E. BONESTEELE, Troy, N. Y.
 WALBRIDGE & CO., Buffalo, N. Y.



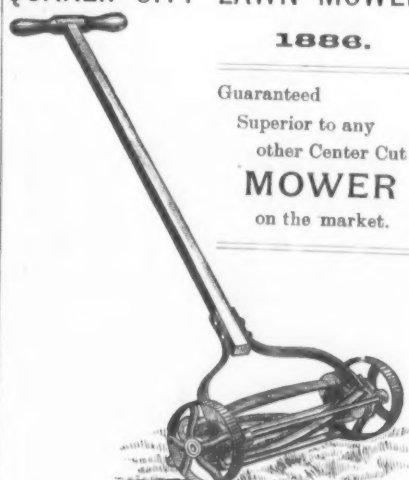
"QUAKER CITY."

The trade will soon find an ordinary and roughly-made Reel of blades and stationary knife is not all that is required to make a perfect Lawn Mower.

THE QUAKER CITY LAWN MOWER.

1886.

Guaranteed
 Superior to any
 other Center Cut
 MOWER
 on the market.



THE QUAKER CITY Reduced in Price.

NOW, WHY BUY A WORTHLESS MOWER?

Send for List.

LLOYD & SUPPLEE HDW. Co., Philadelphia.
 J. C. McCARTY & CO., New York.

"CONTINENTAL."

DOUBLE GEAR.

The Cylinder Knives are solid cast steel, made by a patented process; are hardened and tempered in oil; self-sharpening and never require a file or stone after leaving the factory. All the bearings are long, so that the wear on the Mower will be slow, and oil seldom required. It is made to run at high speed, and will not only cut higher grass, but leaves the lawn perfectly smooth.

Continental Lawn Mower.

1886.

LIGHTEST RUNNING
 AND
 SWIFTEST CUTTING.



CONTINENTAL LAWN MOWER CO., PHILADA.

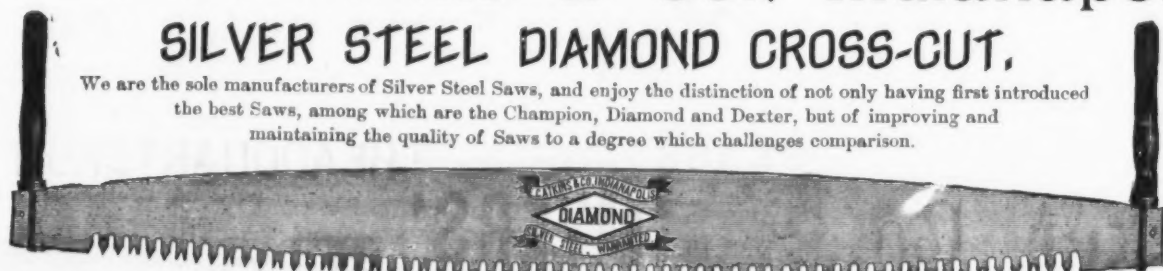
Illustrated Price Lists sent upon application. Please write for same to
 J. C. McCARTY & CO., New York.
 NEWLIN, KNIGHT & CO., Philadelphia.
 A. F. SEEBERGER & CO., Chicago.
 C. W. FAIRMAN, Kansas City, Mo.
 C. VONNEGUT, Indianapolis, Ind.
 SAUL & DAVIS, Syracuse, N. Y.
 J. P. PHILLIPS & CO., Milwaukee, Wis.
 J. P. PHILLIPS & CO., Milwaukee, Wis.
 SPEAR & GITTINGS, Baltimore, Md.
 WOLFE, LANE & CO., Pittsburgh, Pa.
 GEO. WORTHINGTON & CO., Cleveland, Ohio.
 MOLINE FLOW CO., Kansas City, Mo.
 BORTCHER HARDWARE CO., Denver, Col.
 DUNHAM, CARRIGAN & CO., San Francisco, Cal.
 BIGELOW & DOWSE, Boston, Mass.
 STEELE & AVERY, Rochester, N. Y.
 GEO. KINCALO, Utica, N. Y.
 ISAAC WALKER HDW. CO., Peoria, Ill.



E. C. Atkins & Co., Indianapolis, Indiana.

SILVER STEEL DIAMOND CROSS-CUT.

We are the sole manufacturers of Silver Steel Saws, and enjoy the distinction of not only having first introduced the best Saws, among which are the Champion, Diamond and Dexter, but of improving and maintaining the quality of Saws to a degree which challenges comparison.



Ground substantially uniform gauge on the toothed edge, and any gauge required on the back.

ATKINS'

Cross-Cut, Circular, Band and Gang

SAWS

Are Everywhere Recognized as the
 Standard of Excellence.

MINERAL WOOL

(Protected by U. S. Patents.)

An Indestructible Material.

The BEST and CHEAPEST material known for

INSULATION OF HEAT.

PROTECTION AGAINST FROST.

PREVENTION OF SPREAD OF FIRE.

FREEDOM FROM RATS, MICE & INSECTS.

DEADENING OF SOUND.

Used in buildings. It keeps the TEMPERATURE UNIFORM, SAVES largely in the EXPENSE of heating; renders the walls and floors exempt from the CONDUCTING OF SOUND. Completely NON-COMBUSTIBLE. It is very valuable for FIRE-PROOFING. AS A NON-CONDUCTING COVERING for Steam Pipes, Boilers, Drums, Hot Air and Blast Pipes, and all heated surfaces, and as a Protection against Frost for Waste Pipes.

Mineral Wool is Invaluable.

Over Ten Million Pounds in Use.

For Samples, Information and Prices, address

The Western Mineral Wool Co.,

O. Box 123. CLEVELAND, OHIO

A. F. PIKE MFG. CO.,

Pike Station, New Hampshire, U. S. A.

Cable Address, "Pike, Haverhill."

MANUFACTURERS AND WHOLESALE DEALERS IN

BLUE STONE.

The Largest Manufacturers and Dealers in Stones for

Sharpening all Edge Tools.

Pike's celebrated Blue

Stone, Indian Ford (Red

End), Lamolite, Black Dia-

mond, Magic, Green Moun-

tain. All kinds branded

with our name are genu-

ine. Also Oil, Water and Dry

Whetstones; Arkansas

Washita, Turkey, Hindo-

stan and Sandstone

Razor Honer Vienna

Cigar shape.

In fact, everything that is used for sharpening

Edge Tools supplied in any grit or shape required.

Quality and Prices guaranteed. Send in your orders.

GUN POWDER.

LAFLIN & RAND POWDER CO.,

No. 29 Murray Street, New York.

Manufacture and sell the following celebrated brands

of Sporting powder, known everywhere as

Orange Lightning, Orange Ducking,

Orange Rifle,

more popular than any Powder now in use.

BLASTING POWDER and ELECTRICAL BLASTING

APPARATUS. MILITARY POWDER on

hand and made to order.

Safety Fuse, Frictional and Platinum Fuses.

Pamphlets showing sizes of grain sent free.

METAL AND RUBBER STAMPS,

steel figures and letters,

name stamps, type for type

writers, chilled-iron figures

and letters, stamps for rais-

ing letters on wood or

metal, branding irons, pat-

tern letters, stencils, house numbers, metal-bodied

rubber type, rubber stamps, &c. Send for free illus-

trated catalogue.

BELLINGS & DICKEY 837-843 Sheriff St., Cleveland O.

"THE CARVER'S FRIEND."



SOLID EMERY KNIFE SHARPENERS.

HP NAIL CO., CLEVELAND, O.

MANUFACTURERS OF

STANDARD PENNY NAILS.

BRADS OR FINISHING NAILS. CAR NAILS. CIGAR BOX NAILS. TIN AND SLATE

ROOFING NAILS. WIRE SPIKES FOR TRACK AND DOCK WORK. WIRE TACKS.

BLIND AND BED STAPLES AND LINKS. MCGREGOR NAIL BOXES, AND

WIRE NAILS OF ALL KINDS, BARBED OR SMOOTH,

PLAIN, TINNED OR GALVANIZED.

AGENTS:

J. C. McCARTY & CO.,

New York.

J. WALES & CO.,

Boston.

HEATON & DENCKLA HARDWARE CO.,

Philadelphia.

HIBBARD, SPENCER, BARTLETT & CO.,

Chicago.

WEED & CO.,

Buffalo.

C. B. MELISH

Cincinnati, Ohio.

HUNTINGTON, HOPKINS & CO.

San Francisco.

JNO. PRITZLAFF HARDWARE CO.,

Milwaukee.

THE BERLIN IRON BRIDGE CO.,

EAST BERLIN, CONN.

BINGHAMTON, N. Y.

S. C. WILCOX, Pres.

CHAS. M. JARVIS, Vice-Pres. and Chief-Engineer.

BURR K. FIELD, Sec'y and Treas.

JAS. W. PEARL, C. E.,

Manager at Binghamton, N. Y.

IRON BRIDGES & ROOFS.

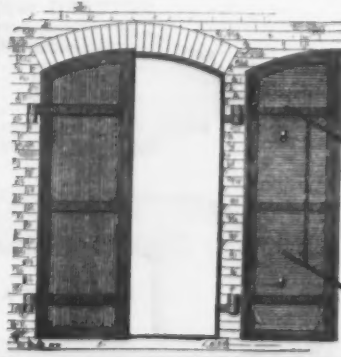
CORRUGATED IRON

FIRE-PROOF

DOORS & SHUTTERS.

We make the only Iron Door or Shutter which is an absolute protection against fire, as proved by actual fire test.

WRITE FOR PRICES.



Knoxville Car Wheel Co.

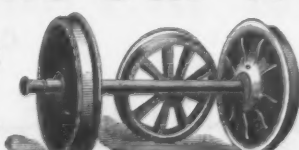
Manufacturers of

CHILLED WHEELS

OF ALL KINDS,

With or Without Axles.

KNOXVILLE, TENN.



THE CELEBRATED

Carter County

Cold Blast

Charcoal Iron

IS USED EXCLUSIVELY BY

THIS COMPANY

CRONK HANGER CO.,

ELMIRA, N. Y.



MANUFACTURERS OF THE

CRONK'S PATENT

Wire Cutter, Bender and Plier and Hog Ringer Combined.

Specially Adapted for Use on Wire Fences; also Best in the World
 for TINNERS' Use. Patent Allowed.

Patent "Special" Improved Locomotive Cylinder Boring Machine



Will bore out Locomotive Cylinders in THEIR PLACES by removing one or both heads and piston. THE END THRUST IS ALWAYS IN EXACT LINE WITH BAR.

Circulars with full description on application.

L. B. FLANDERS MACHINE WORKS,

PEDRICK & AYER, Props.,

PHILADELPHIA, PA.



WIRE STAPLES

IN EVERY VARIETY.

CHISEL AND LANCET (or Boardman) POINT.

BLIND STAPLES A SPECIALTY.

Send for Sample and Prices.

HOAG & TITCHENER, Binghamton, N. Y.

J. E. QUACKENBUSH & SON,
 MANUFACTURERS OF
 Porcelain, Mineral & Jet Knobs & Escutcheons.

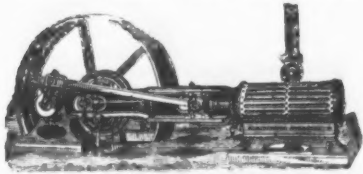
Send for Price List

and Terms.

1535 8th Ave., N. Y.



THE CUMMER ENGINE



Awarded Gold Medals and All Highest Premiums for BEST AUTOMATIC ENGINE at both Cincinnati and Louisville in 1883.

Send for 150-Page Illustrated Catalogue.

ADDRESS

THE PROSPECT MACHINE & ENGINE CO.,
Formerly THE CUMMER ENGINE CO., Cleveland Ohio.



Issues Policies of Insurance after a careful Inspection of the Boilers,
COVERING ALL LOSS OR DAMAGE TO
BOILERS, BUILDINGS and MACHINERY,
ALSO COVERING LOSS OF LIFE AND ACCIDENT TO PERSONS, ARISING FROM
STEAM BOILER EXPLOSIONS.

Full information concerning the plan of the Company's operations can be obtained at the
COMPANY'S OFFICE, HARTFORD, CONN.,
or at any agency.

M. ALLEN, Pres.

W. B. FRANKLIN, Vice-Pres.

J. B. PIERCE, Sec.

BOARD OF DIRECTORS:

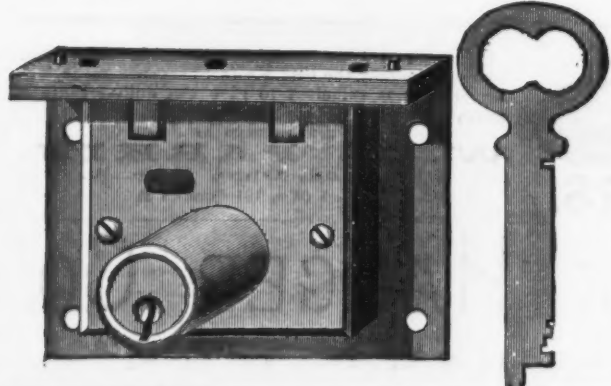
J. W. ALLEN, President.
LUCIUS J. HENDEL, President Atlas Fire Ins. Co.
FRANK W. CHENEY, of Cheney Bros., Silk Manuf.,
Hartford and New York.
CHARLES M. BEACH, of Beach & Company.
DANIEL PHILLIPS, of Adams' Express Company.
GEO. M. BARTHOLOMEW, President Holyoke Water
Power Company.
RICHARD W. H. JARVIS, President Colt's Pat. Fire
Arms Manufacturing Co.
THOMAS O. ENDERS, of the Atlas Life Insurance Co.

LEVERETT BRAINARD, of the Case, Lockwood &
Brainard Co.
GEN. WM. B. FRANKLIN, Vice-President Colt's Pat.
Fire Arms Mfg. Co.
GEO. CROMPTON, Crompton Loom Works, Worcester,
Mass.
NEWTON CASE, of the Case, Lockwood & Brainard Co.
NELSON HOLLISTER, of the State Bank, Hartford.
CHAS. T. PARKY, of Baldwin Locomotive Works,
Philadelphia.
HON. HENRY C. ROBINSON, Attorney at Law, Hart-
ford.

Charles Parker Co.,

Meriden,
Conn.,
Manufacturers of

Cabinet
Locks.



"ECLIPSE"

Pipe-Cutting Machines,

PANCOAST & MAULE.

243 & 245 South Third St.,

PHILADELPHIA.

ARE
EFFICIENT,
POWERFUL,
CHEAP

Send for Circular and Price-List.
No. 1.—Hand Pipe-Cutting Machine, cuts 1/4 to 1 inch.
No. 2.—Hand Machine, cuts 1/4 to 1 inch.
No. 3.—Power Machine, cuts 1/4 to 1 inch.
Cutting-Off Machine, cuts 1/4 to 1 inch.
for Shafting, etc., cuts 1/4 to 1 inch.

THE CHAPLIN MFG. CO., BRIDGEPORT, CONN.,

MANUFACTURERS OF

**THE CHAPLIN PATENT
ROLLER BEARING**

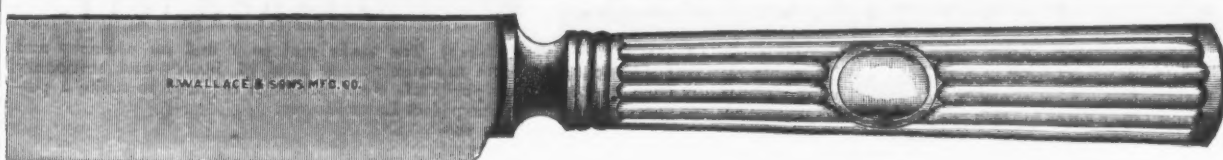
FOR
Journals of Elevators, Machinery, Heavy
Shafting, Overhead Track Sheaves in
Mines, Hand Cars, Trucks, &c.

Tramway Car Boxes a specialty; guaranteed under any
weight. Rolls are made of Hardened Steel. Estimates
and correspondence solicited for all classes of work.

Wm. Rogers' German Silver and Plated Spoons and Forks. Send to SIMPSON, HALL, MILLER & CO.,
Wallingford, Conn., for Illustrated Catalogues. Branch Houses: 25 East 14th St., New York;
404 Commerce St., Phila.; 106 State St., Chicago,
Ill.



Factories:
Wallingford, Conn.



The above cut represents one design of our new Hollow Handle Knife, either silver or nickel silver handles, made of a seamless drawn tube. This handle is not soldered, as is the usual method, and yet has the taper and form necessary to produce the most durable and tasteful article of its kind ever shown. Knives can be furnished either plain or ornamented handles.

R. WALLACE & SONS MANUFACTURING COMPANY,

MANUFACTURERS OF SOLID SILVER WARE GUARANTEED $\frac{999}{1000}$ FINE, ALSO NICKEL SILVER HOTEL AND TABLE WARE,

Factories, WALLINGFORD, CONN.

New York House, 21 PARK PLACE.

LA BELLE STEEL NAILS

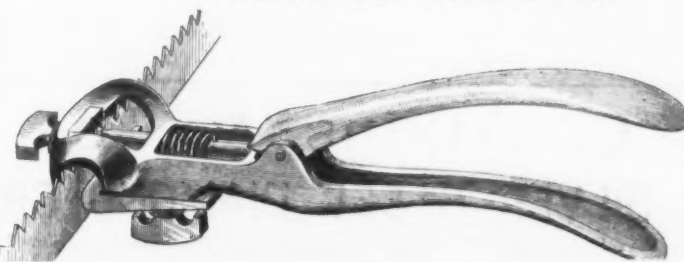
OF EVERY VARIETY ARE MANUFACTURED BY THE

LA BELLE IRON WORKS.

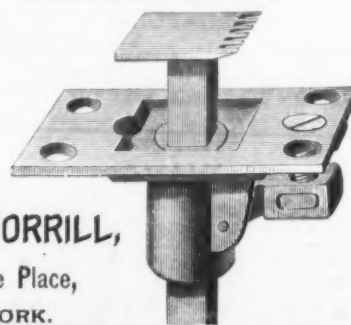
OFFICE AND WORKS, . . . WHEELING, W. VA.

MORRILL'S PERFECT SAW SETS AND BENCH STOP.

FOR SETTING EVERY VARIETY OF SAWS.



For price lists
and discounts
Address



CHAS. MORRILL,
64 College Place,
NEW YORK.

GLASS The most perfect and non-
corrosive valve seat, used
only in Myers' Pumps.

MYERS' FORCE-PUMP

Adapted to open and drilled wells. The
only double acting force-pumps furnished
with expansive plunger bucket and Glass
Valve-seat. The only successful
Drill Well Pump made.

Simple, durable, powerful, easy to operate.
Never affected by frost.

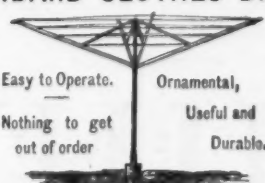
MYERS' DOUBLE LOCK REVERSIBLE HAY CARRIER.

A perfect reversible
carrier. New Myers'
iron, steel and wood
track carriers. The
simplest carriers made.
Double and single har-
poon hay forks, pulleys,
grapples, sling attachments, grapple
hay forks, door and hanging hooks, etc.

F. E. MYERS & BRO., ASHLAND, O.

Hardware Specialties.

STANDARD CLOTHES DRYER.



Easy to Operate. Ornamental,
Nothing to get Useful and
out of order Durable.

They are unequalled for the
YARD, BACK BALCONY OR ROOF,
having large amount of line in small space. Oiled
arms. Cotton line. Japanese or galvanized iron
trimmings. No spinning to break or bend. Tops can
not blow off. Weight, 33 pounds. Compact for ship-
ment. Made in two sizes and three styles.

EUREKA CLOTHES DRYER.

For the Laundry and Kitchen.

HITCHING POSTS, STABLE FURNITURE, WOOD
HARNESS PINS, STORE TRUCKS, &c.

JOHN CAMPBELL,

Manufacturer of Hardware Specialties,
MANCHESTER, N. H.

Send for Illustrated Circulars and Price List.

OTIS & BROWN, Western Agts., 154 Lake St., Chicago, Ill.

Chapman Valve Mfg. Co.,

MANUFACTURERS OF

VALVES AND GATES

—FOR—

Water, Steam, Gas, Ammonia, &c.

GATE FIRE HYDRANTS,

with and without

INDEPENDENT NOZZLE VALVES.

All Work Guaranteed.

Works and General Office:

INDIAN ORCHARD, Mass.

Treasurer's Office

72 Kilby and 112 Milk Streets,

BOSTON, Mass.

LITTLE GIANT

WAGON

Tire Upsetter,

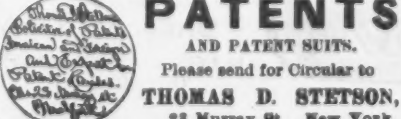
The Best and Cheapest.

Send for Circular,

price lists and discount.

LITTLE GIANT MFG. CO.

MILLPORT, N. Y.



PATENTS

AND PATENT SUITS.

Please send for Circular to

THOMAS D. STETSON,

23 Murray St., New York.

HEADQUARTERS FOR DOG COLLARS,

Wire and Leather Muzzles of every Description.

POPE &
STEVENS



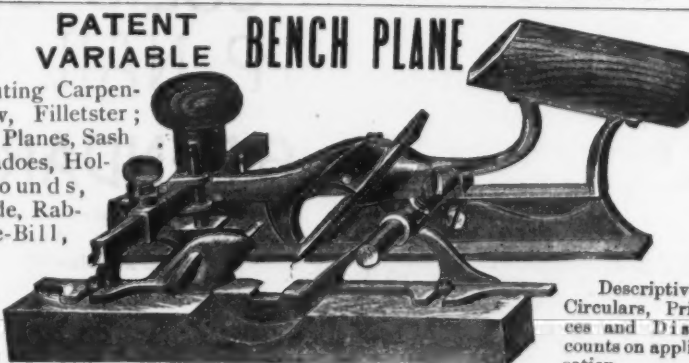
CHAMBERS'S
NEW YORK

THE ABOVE CUT REPRESENTS OUR

CHAMOIS LINED DOUBLE CURB GERMAN SILVER COLLAR.

FALE'S PATENT VARIABLE BENCH PLANE

Constituting Carpen-
ter's Plow, Filletster;
Matching Planes, Sash
Planes, Dadoes, Hol-
lows, Rounds,
Beads, Side, Rab-
bet, Snipe-Bill,
Etc.



OTIS A. SMITH
Rockfall,
Conn.

Descriptive
Circulars, Pri-
ces and Dis-
counts on appli-
cation.

A Good Selling Article in a Dull Season.

ROBERT'S

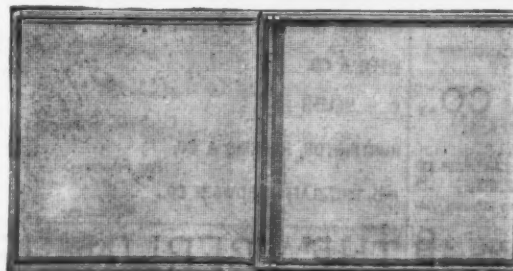
PAT. ADJUSTABLE

WINDOW SCREEN.

GET OUR

PRICE LIST.

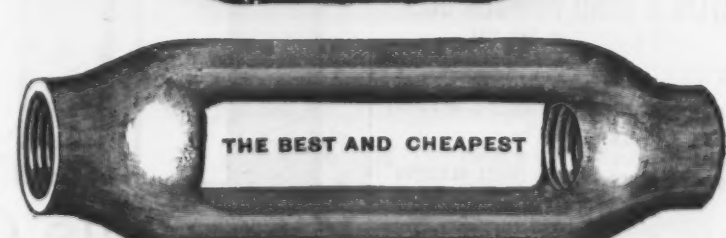
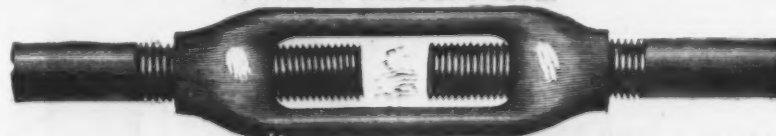
It costs you nothing.



THE MANUFACTURERS,

PAINE, DIEHL & CO., 10 Bank St., PHILA., PA.

PRESSED WROUGHT IRON.

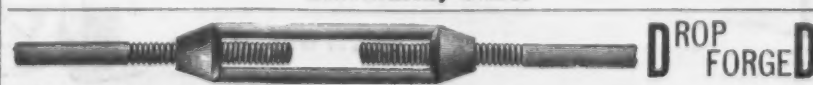


THE BEST AND CHEAPEST

Made by

CLEVELAND CITY FORGE & IRON CO.,

Cleveland, Ohio.



DROP FORGED

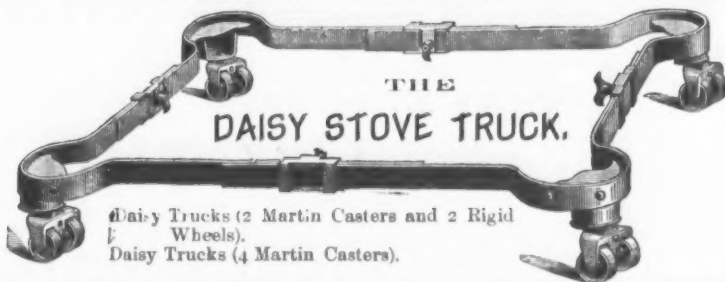
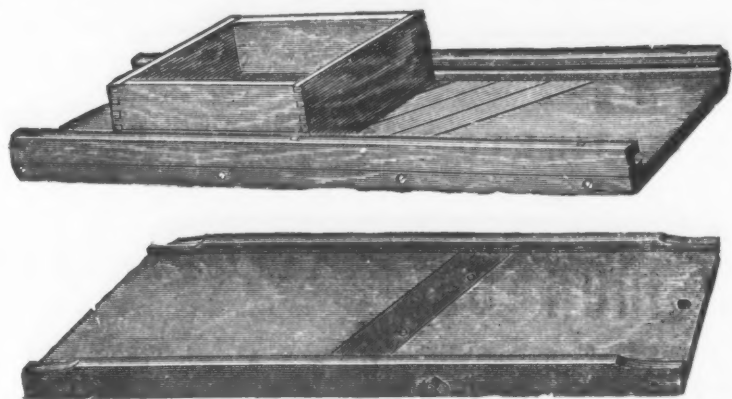
MERRILL BROS., 26 First St. Brooklyn, E. D., N. Y.

THE TUCKER & DORSEY MANUFACTURING CO.,

INDIANAPOLIS, INDIANA.

Manufacturers of Alarm Tills, Stove Trucks, Saw Bucks, Kraut, Slaw and Vegetable Cutters, Towel Racks and Rollers, Tinner's Mallets, Hats and Coat Racks, &c., &c.

WRITE FOR PRICES AND DISCOUNTS TO THE TRADE.



JOHN T. LEWIS & BROS.,
SUCCESSORS TO MORDECAI LEWIS,
Established 1772.



Pure White Lead in oil, the most reliable for White-ness, Fineness, Body, and Covering Capacity.
RED LEAD, Litharge and Orange Mineral.
PAINTERS' COLORS of a Very Superior Quality.
LINSEED OIL, Raw, Boiled and Refined.

JOHN JEWETT & SONS,
MANUFACTURERS OF THE WHITE LEAD. WELL-KNOWN BRAND OF



ALSO MANUFACTURERS OF
LINSEED OIL.
181 Front Street, New York.



ATLANTIC WHITE LEAD and LINSEED OIL CO.,
MANUFACTURERS OF

ATLANTIC PURE WHITE LEAD, unequalled for Uniform Whiteness, Fineness and Body. The most reliable White lead made. RED LEAD and LITHARGE.

Raw, Refined LINSEED OIL and Boiled

287 Pearl St., New York.

Grindstones, Emery, &c.

Geo. H. Worthington, Pres. and Treas. Wm. McDermott, V. Pres. and Sec.

Berea & Huron Stone Company,
Manufacturers of
GRINDSTONES,
MOUNTED STONES,
SCYTHE STONES, &c.

OFFICE: 71 & 72 Wilshire Building. CLEVELAND, OHIO.

Walter R. Wood,
GRINDSTONES,
Berea, O., Nova Scotia & other brands.
283 and 285 Front St., New York.

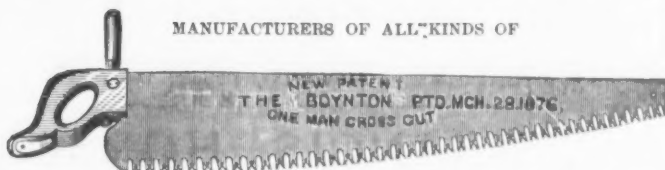
GEO. CHASE.

Genuine Green Paper Brand Wash-ita Stone is the Best

OIL STONE.
107th St., Harlem River, N. Y.

THE UNION SAW CO

MANUFACTURERS OF ALL KINDS OF



SAWS, SAW-SETS, PATENT CROSS-CUT HANDLES,
TOOLS AND FILES,

AND SOLE PROPRIETORS AND MANUFACTURERS OF

THE BOYNTON PATENT LIGHTNING SAWS.

FACTORY: 34, 36, 38, 40 and 42 Devoe St., BROOKLYN.

OFFICE and WAREHOUSE, 337 Broadway, New York City.

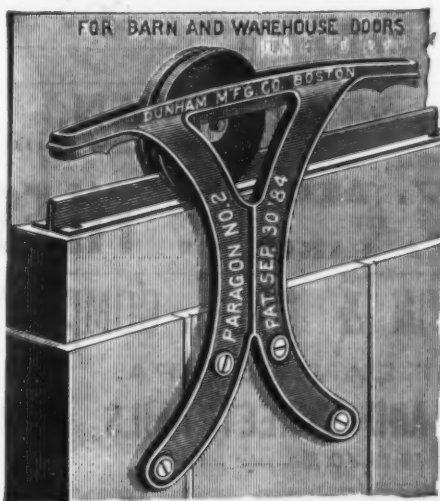
PARAGON ANTI-FRICTION DOOR HANGER.

SPECIFIED BY ARCHITECTS AND BUILDERS.

We make the broad claim that the PARAGON HANGER is the BEST device for operating sliding doors ever shown to the Trade,

— BECAUSE —

It is the strongest and most durable, made in one solid piece from air-furnace refined malleable iron (no bolts or rivets to wear and work loose), is the easiest operated, impossible to derail and never requires lubricating, and is by far the handsomest and finest finished Hanger in the market. Using the only polished steel Tee-Rail ever invented. Are made in three sizes (4 to 24 ft. run) for Barn and Warehouse use. No. 4 Parlor Hanger, pat. fiber wheel, absolutely noiseless, cannot wear out. Nos. 5 and 5 1/2 for elevator and small house doors, and No. 6 Car Door Hanger now adopted by the leading railways in the United States.



The Dunham Mfg. Co.,

SOLE MANUFACTURERS,

BOSTON, MASS.

GEN'L AG'TS., { LOUDERBACK, GILBERT & CO., 33 Chambers St., New York.
NEWLIN, KNIGHT & CO., Philadelphia, Pa.
EMERY, WATERHOUSE & CO., Portland, Me.

ROCK and ORE BREAKERS and CRUSHERS.

(The Blake Style.)

This style of Rock Breaker, after 15 years' practical test at HOME and ABROAD, has proved to be the best ever designed for the purpose of breaking all kinds of hard and brittle substances, such as

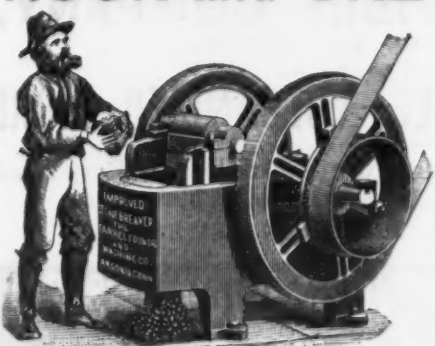
Quartz, Emery, Gold and Silver Ores, Coal, Plaster.
Iron, Copper, Tin and Lead Ores.

ALSO FOR MAKING

RAILROAD BALLAST AND CONCRETE.

Mr. S. L. MARSDEN, who for the past 20 years has been connected with the manufacture of the "Blake Crusher," superintends the making of the machine. Gold Medal awarded at the Massachusetts Mechanic Association, 1881, and Silver Medal (Special) at American Institute, New York, 1882. Address

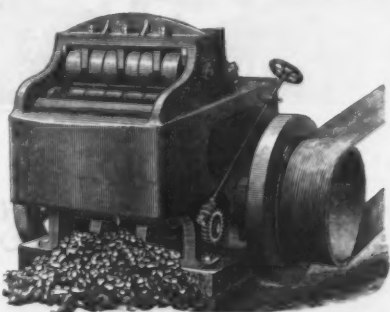
FARREL FOUNDRY AND MACHINE CO.,
ANSONIA CONN.



BRENNAN

ROCK AND ORE BREAKER AND CRUSHER.

A NEW AND EFFECTIVE PRINCIPLE IN THE CRUSHING AND DISCHARGING ACTION.



The stroke can be adjusted to suit any kind of rock and size of product while machine is in motion.

A feature possessed by no other Crusher in the market.

Will take Larger Rock, give more Uniform Product, and more of it, than any other Crusher.

POSITIVE SAFETY FROM BREAKAGE.

Small Amount of Power Required.

For strength, capacity and range of work, the BRENNAN is the best Crusher ever produced.

Always examine the BRENNAN CRUSHER before placing an order.

Send for Circular and Prices.

G. G. YOUNG, 42 Cortlandt St., New York.

TOWER & LAMONT,

MANUFACTURERS OF RAZOR STROPS, Rochester, N. Y.



The LAMONT is the original Combination Razor Strop and the Standard. It positively has no equal. If your jobber does not have it, send to us. Belt of Russian leather.

Palmer's Common Sense

FRAME PULLEY.

Saves the User 50 Cts. Per Doz.

Mortising all done with a bit. No chisels or other tools required.

By hand—eight to one.

By power—twelve to one.

The only Frame Pulley the Trade can handle with profit.

The only Pulley users will buy after seeing this.

Send for Circulars.

MANUFACTURED BY

Palmer Mfg. Co., Troy, N. Y.

Sole Eastern Agents,

PEABODY & PARKS, Troy, N. Y.

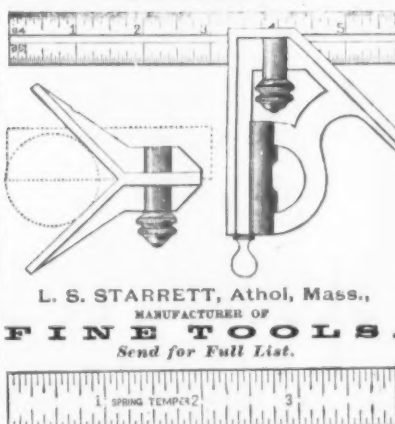


Amidon's Corner Brace.

WE MANUFACTURE
8 Different Styles
BIT BRACES.

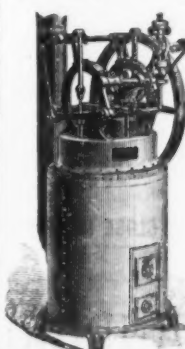
Our BARKER BRACE is made in 4 grades, and our RATCHET BRACE in 3 grades, the cheapest finish being just as substantial as the best. Send for Catalogue.

AMIDON & WHITE,
135 & 137 Main St., through to 10, 12 & 14 Quay St.
BUFFALO, N. Y.



L. S. STARRETT, Athol, Mass.,
MANUFACTURER OF
FINE TOOLS.
Send for Full List.

MCKINLEY PATENT AIR + ENGINE.



The Best and Cheapest on the Market.

No Steam. No Water. Absolute Safety. No Engineer. No Pumps. No Gauges. No Liability to freeze up. No Regulation required.

NO EXTRA INSURANCE. Can be used for any purpose where power is required.

Cheap Fuel. Cheap First Cost.

For further information, references, prices, &c., call or address

MCKINLEY ENGINE CO.,

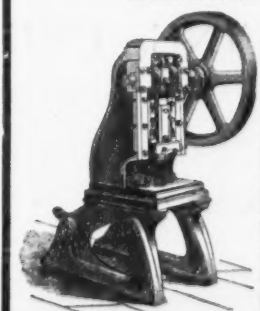
17 Broadway, Cincinnati, Ohio.

Name this Paper.

The Waterbury Farrel Foundry and Machine Co.,

MANUFACTURERS,

WATERBURY, CONN.

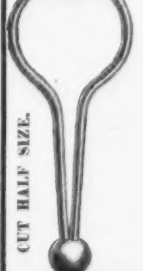


Rolling Mills. Rivet and Bolt Machines. Patent Power Presses. Wire Mills. Drop Presses. Chilled Rolls. Spinning Lathes. Trimming Lathes. Foot Presses. Die & Punches. Gang Slicers. Grinding Machines. Cartridge Machinery. Screw Threading Machines. All kinds of special Machinery for Sheet Metal and Wire.

THE PERFECT Towel Holder

This little article is unequalled for hanging Kitchen, Shop, Bar Room and other Towels, for suspending temporary curtains and numerous other purposes. They have met with unparalleled success for the short time they have been on the market, and are liked by all who see them. Sample gross, \$7.50 net. Special prices given on large quantities.

HAFF & CO., Box 24,
HARTFORD, CONN.
Pat. Dec. 1, 1885.



CHAMPION IRON FENCE CO.,

KENTON, OHIO.

Largest Iron Fence and Rolling Works in U. S.



SPECIALTIES—Iron Stairs and Jail Work, Builders' and Ornamental Iron Work, and the only manufacturers of Malleable Iron Cresting, guaranteed against breakage; also manufacturers of the Celebrated Ohio Champion Iron Fence and Lift Pumps. Send for 150-page Catalogue.

THE HATCH BROTHERS CO.,
BRIDGEPORT, CONN.,

MANUFACTURE

Patented Novelties,
FINE POCKET CUTLERY, SPECIAL TOOLS OR
MACHINERY, LIGHT HARDWARE, &c.
Blades for Special Purposes Made to Order.

S. & C. WARDLOW SHEFFIELD, ENGLAND, MANUFACTURERS OF THE CELEBRATED Cast and Double Shear Steel

In Bars, Sheets and Coils, for fine Pen and Pocket Cutlery, Razors, Table Knives, Mining Tools, Dies, Files, Clock, Watch and other Springs, and Sole Makers of the Special Brand "Tough" Cast Steel for Turning and other Tools.

OFFICES AND WAREHOUSE,
95 JOHN STREET, NEW YORK.

FRANK S. PILDITCH, Agent.

JESSOP'S STEEL 91 John St., NEW YORK.

W. W. SCRANTON
President.

WALTER SCRANTON
Vice-President.

E. P. KINGSBURY,
Sec'y and Treas.

THE SCRANTON STEEL COMPANY, MANUFACTURERS OF Steel Rails and Billets.

Works at SCRANTON, PA.

NEW YORK OFFICE,
47 BROADWAY.

BESSEMER AND OPEN-HEARTH

BLOOMS, BILLETS AND SLABS.

H. E. COLLINS & CO., 34 Lewis Block, Pittsburgh, Pa.

SYRACUSE STEEL FOUNDRY,
FRAZER & JONES CO., Proprietors, SYRACUSE, N. Y.,
Manufacturers of

MILD CRUCIBLE STEEL CASTINGS FREE FROM BLOW-HOLES.

On account of softness of metal but slight annealing is required to relieve stresses, therefore hurried orders can be filled in three or four days after receipt of patterns. The material can be worked in machine, forged and welded without difficulty. Gears, Pinions, Cranks, Cams, Cross Heads, Rocker Arms and all descriptions of Machinery Castings.

HAVING STOOD THE TEST OF 135 YEARS COMPETITION, THEY ARE IN HIGHER REPUTE THAN EVER.

JOHN WILSON'S CELEBRATED BUTCHERS' KNIVES & BUTCHERS' STEELS

ARE USED IN ALL THE PRINCIPAL SLAUGHTERING AND MEAT PACKING ESTABLISHMENTS OF THE UNITED STATES OF AMERICA, & THE AUSTRALIAN COLONIES; AND, WITH HIS EQUALLY CELEBRATED SHOE KNIVES HAVE FOUND THEIR WAY, AND CARRY HIS INTO ALL THE COMMERCIAL MARKETS OF THE WORLD.

BEWARE OF CLOSE IMITATIONS OF THE KNIVES; ALSO OF COUNTERFEITS OF THE MARK, AS BOTH HAVE BEEN, AND ARE, FREQUENTLY ATTEMPTED.

WORKS:--SYCAMORE STREET, SHEFFIELD, ENGLAND. Established 1750.

THE STANDARD IRON COMPANY,

MANUFACTURERS OF

SHEET IRON AND SHEET STEEL,

COMMON OR SMOOTH FINISH.

+ CORRUGATED +

ROOFING, CEILING AND SIDING,

STRAIGHT OR CURVED.

Bridgeport, - - - Ohio.



GEORGE B. TURRELL, Pres.

DUNCAN K. MAJOR, Treas.

Union Hardware Co., Torrington, Conn., U. S. A.,

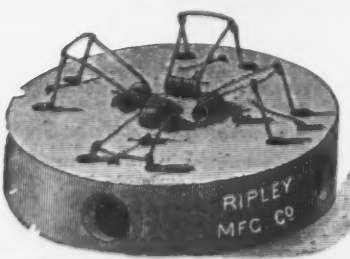
MANUFACTURERS OF SPECIALTIES IN
Hardware & Leather.

Electroplaters in Gold, Silver, Nickel and Brass. Wood Turners in the following varieties of Wood:

Phony,	Hickory,	Iron Wood,
Lancewood,	Appletree,	Laurel,
Cocobola,	Chestnut,	Cedar,
Rosewood,	Beech,	Cherry,
Mahogany,	Walnut,	Basswood,
Birch,	Lignumvita,	Poplar,
African Redwood,	Oak,	Batternut,
Turkey Boxwood,	Madaira,	Hemp,
Live Oak,	Locust,	Pepperwood.

ESTIMATES FURNISHED ON APPLICATION.

New York office in charge of
Tower & Lyon, 95 Chambers St.



"COMMON SENSE" MOUSE TRAP.
BEST IN MARKET.
For Home & Export Trade.

RIPLEY MFG. CO.,
Unionville, Ct., U. S. A.,
Manufacturers of

Porcelain-Lined Lemon Squeezers, Mallets, Rose Wood Faucets, Patent Boot Jacks and Hardware. Fine Wood Turning a Specialty.

STEEL Gautier Steel.

SEE PAGE 3.

SMITH BROS., & CO.,

LABELLE STEEL WORKS,

Ridge Ave. and Belmont St., Allegheny City, Pa.

POST OFFICE ADDRESS, PITTSBURGH, PA.

MANUFACTURERS OF ALL KINDS OF

STEEL

SPRINGS, AXLES, RAKE TEETH, ETC.

WETHERELL BROS., Eastern Representatives,
31 Oliver St., Boston, and 115 Liberty St., N. Y.

C. E. JAMES & CO.,
Chattanooga, Tenn.

TROY STEEL AND IRON CO.,

TROY, N. Y., Manufacturers of

BESSEMER STEEL RAILS,

Fish Plates, Bolts, Nuts, Spikes, &c. Machinery

Steel, Merchant and Ship Iron.

CHESTER GRISWOLD, Pres't, Duncan Building, 11 Pine St., N. Y. City.

FRANCIS HOBSON & SON,

97 JOHN STREET, NEW YORK.

Sole Manufacturers of "CHOICE" EXTRA CAST STEEL.

MANUFACTURERS OF

Warranted Best Cast Steel

FOR TOOLS AND DIES, AND

"CHOICE" EXTRA NEEDLE WIRE.

DON WORKS, SHEFFIELD, ENGLAND.

CHAS. HUGILL, Agent.

NEWTON & SHIPMAN,

83 JOHN ST.,

NEW YORK.

GENERAL AGENTS FOR

STEEL "F. W. MOSS" FILES.

AND
"MOSS & GAMBLE'S"

THE MONTGOMERY IRON & STEEL COMPANY,

WORKS AT DANVILLE, PA.

PIG IRON, T AND STREET RAILS.

Light Rails, 12 to 40 lbs. per yard.

RAIL JOINTS, SPIKES AND BAR IRON.

W. E. C. COXE, President, Reading, Pa.

T. F. MCGINNES, Gen'l Supt., Danville, Pa.

VULCANIZED FIBRE COMPANY,

WILMINGTON, DELAWARE,

SOLE MANUFACTURERS OF

HARD AND FLEXIBLE VULCANIZED FIBRE

Electrical, Mechanical and Railroad uses, Carriage Axle Washers, Pump Valves, Packings, Condenser Ferrules, Journal Bearings, Bushings, &c.

NEW YORK OFFICE, No. 15 DEY ST.

JESSE JONES & CO.
No. 615 COMMERCE ST.
PHILADELPHIA, Pa.

SHED BOXES

MADE OF WOOD WITHOUT NAILS OR SCREWS.

SEND FOR CATALOGUE.

PAPER BOXES ALL KINDS FOR HARDWARE.

W. H. JACOBUS.

DONALD McKAY, Jr.

W. H. JACOBUS & CO., HARDWARE MANUFACTURERS' AGENTS,

No. 90 Chambers Street, New York.

AGENTS FOR

The Morris Sash Lock Mfg. Co., The Ireland Mfg. Co., Lorenz Bommer, Penn Lock Works
Dibble Mfg. Co., Thurston Mfg. Co., Zimmerman's Blind Adjusters.
Keystone Screw Co., J. F. Wollensak, Tuck Mfg. Co.

BRASS AND IRON SHIP CHANDLERY HARDWARE.

Yacht Fixtures, Nickel-Plated Canoe Trimmings, Cheapest and Best Side Lights in the Market, Awning Hardware. Specialties in Brass made to Order.

THE SHELTON BRASS HARDWARE CO., Birmingham, Conn.

Send for Illustrated Catalogue.

NEW YORK WAREHOUSES: 96 Chambers St. CHICAGO WAREHOUSES: 177 Lake St.

R. MUSHET'S SPECIAL STEEL

FOR

LATHES, PLANERS, &c.

Turns out at least double work by increased speed and feed, and cuts harder metals than any other steel. Neither hardening nor tempering required.

SOLE MAKERS,

SAMUEL OSBORN & CO.,
SHEFFIELD, ENGLAND.

Represented in the United States by

B. M. JONES & CO.,
Nos. 11 and 13 Oliver Street, BOSTON.

NAYLOR & CO.,

99 John Street, New York.

Iron Ores, Bessemer Pig Iron,

Spiegeleisen, Ferromanganese,

Ferrosilicium, Scrap Iron,

Steel and Iron Wire Rods,

Norway Bars and Shapes,

Scrap Steel, Rail & Bloom Ends,

Old Iron and Steel Rails,

Tin Plates, Pig Tin,

Spelter, Lead, Sheet Zinc,

Iron and Steel Beams,

Steel Rails, Tires & Axles,

Steel Blooms, Slabs, Bars, and Hoops,

Cotton Ties.

The Iron-Masters' LABORATORY.

Exclusively for the

Analysis of Ores of Iron, Pig and Manufactured Iron, Steels, Limestone, Clays,

Slags and Coal for Practical

Metallurgical Purposes.

No. 339 Walnut St., Philadelphia.

With Branch at Warrenton, Virginia.

J. BLODGET BRITTON.

This laboratory was established in 1866, at the instance of a number of practical Iron Masters, expressly to afford prompt and reliable information upon the chemical composition of the substances above mentioned, for smelting and refining purposes, the object being to make it at once a convenient, practically useful, and comparatively inexpensive adjunct to the Furnace, Forge and Rolling Mill.

THE AMERICAN

WIRE NAIL AND TACK MACHINE

(PATENTED)

Claims advantages over other machines for general simplicity, adjustment of cutters, both vertically and horizontally, greater gripping power through use of compound levers, positive adjustable knock-off, uniform feed and automatic harbing attachment.

A. R. WHITNEY & CO.,

SOLE AGENTS,

P. O. BOX 33. 17 Broadway, New York.

P. F. BURKE,

Successor to C. F. Dewick & Co.,

Manufacturer of

PATENT STEEL

Toe Calks,



360 Dorchester Avenue, Boston, Mass

CLINE'S LIGHTNING METAL POLISH

The best Liquid Polish in the world. Cleans Plate Glass, Tin, Copper, Brass, Zinc, Nickel, Silver and Plated Ware. In four ounce bottles, price 25 cents. For sale by Druggists and Hardware Dealers. Manufactured by

The Cline Manufacturing Company,
42 and 44 W. Monroe St., Chicago, Ill.

A. PARDEE, Hazleton, Pa.

J. G. FELL, Phila.

A. PARDEE & CO.,

237 South Third Street.

PHILADELPHIA.

No. 111 Broadway, New York.

MINERS AND SHIPPERS OF

LEHIGH COALS

The following superior and well-known Lehigh Coals are mined by ourselves and firms connected with us, viz.:

A. Pardee & Co.,

Pardee, Bro. & Co.,

Calvin Pardee & Co., HOLLYWOOD.

Pardee, Sons & Co., MT. PLEASANT.

HAZLETON,
CRANBURY,
SUGAR LOAF,
LATTIMER.

THOS. FIRTH & SONS, Lim'd, SHEFFIELD, CRUCIBLE CAST STEEL.

JERE ABBOTT & CO.,

Agents and Importers of

SWEDISH IRON,

35 Oliver St., Boston. 23 Cliff St., New York.

GUSTAF LUNDBERG,

AGENT FOR

N. M. HÖGLUND'S SONS & CO.,

OF STOCKHOLM,

Swedish & Norway Iron

38 KILBY STREET, BOSTON.

PAGE, NEWELL & CO.,

139 Milk Street, Boston.

IRON, STEEL AND METAL MERCHANTS,

IMPORTERS OF

SWEDISH IRON,

Including Charcoal, Siemens-Martin and Bessemer Productions, Bars, Shapes, Rods, Billets, Blooms.

DELIVERIES MADE AT ALL PROMINENT AMERICAN, CANADIAN AND PROVINCIAL PORTS.

SWEDISH IRON. CHARLES G. LUNDELL,
No. 7 Exchange Place, BOSTON, MASS.

SWEDISH IRON AND STEEL
LEWANDER & CO.
Agents for L. G. BRATT & CO., of Gothenburg, Sweden.
(NORWAY) Main Office: 12 Post Office Square, Boston, Mass.



Duplex Swing.

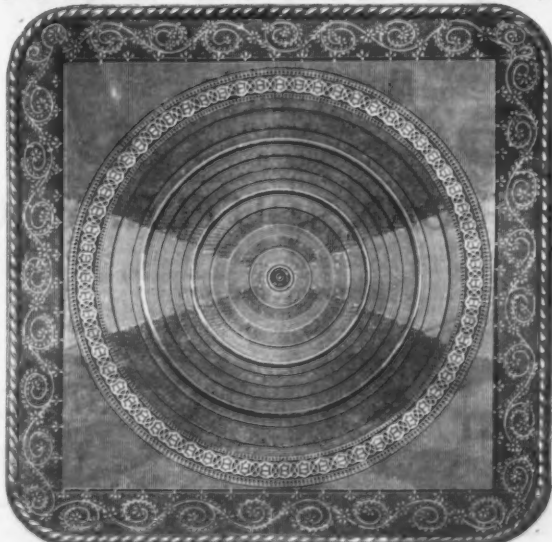
The popularity of the Duplex Swing in the short time it has been introduced is phenomenal. The Swing is constructed on original mechanical principles. The frame is so interlocked as to be prevented from sagging, even if the bolts are loose, a feature not possessed by any other swing manufactured. There are two sizes manufactured, adapted for both lawn and parlor. No. 1, or largest size has standards 9 feet 10 inches long, with a spread of about 6 feet, and 5 feet in width. The frame work is so constructed that by taking out two bolts the standards will close up, and by taking out the bolts of the two cross pieces the frame can be closely folded ready for shipping. The Swing can be put up or taken down ready for packing in 10 minutes.

The weight of the Swing is a little less than 100 pounds. It is very strong, having been tested by four men whose weight aggregated over 800 pounds.

The No. 2, or parlor size, has standards about 7 feet long, and otherwise proportioned in size, weighing less than 75 pounds. They combine simplicity of construction, beauty and strength, and can be operated with ease by small children in the swing.

For Sale by all Leading Dealers.

BUFFALO STOVE BOARDS.



PATENTED.

We beg to inform our patrons that we are now using new and improved machinery in manufacturing our Stove Boards, which enables us to improve their appearance. They will be handsomely polished and beautifully embossed with new designs. The Boards made by us this season we consider the handsomest in market. Please send for Illustrated Price Lists and Discounts.

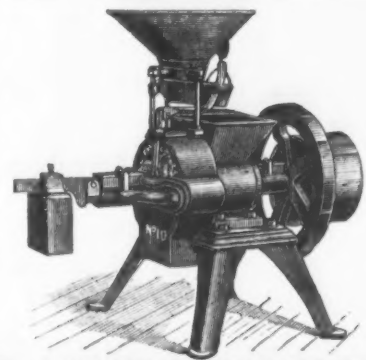
SIDNEY SHEPARD & CO., BUFFALO, N. Y.
C. SIDNEY SHEPARD & CO., CHICAGO, ILL.

PORT CHESTER BOLT & NUT CO.,

Port Chester, N. Y.,
MANUFACTURERS OF

BOLTS, NUTS, RIVETS and WASHERS.

CHAMFERED AND TRIMMED
SQUARE AND HEXAGON NUTS A SPECIALTY.



The F. WILSON PAT. GRINDING MILL

FOR GRINDING WET, GREEN, GREASY OR DRY BONES.

For Poultry and Agricultural purposes, by Hand or Power. Circular with Price List on application.

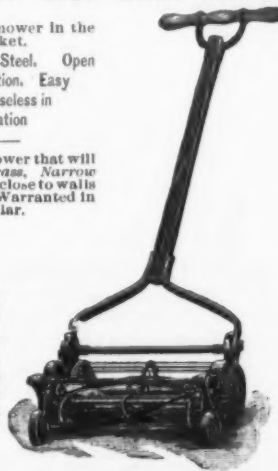
WILSON BROS. Sole Manufacturers, EASTON, PA., U. S. A.

THE NEW EASY LAWN MOWER.

The leading mower in the market. Front Cut. Steel. Open Roller Traction. Easy and Noiseless in Operation.

The only mower that will cut Wet Grass, Narrow Borders, and close to walls and fences. Warranted in every particular.

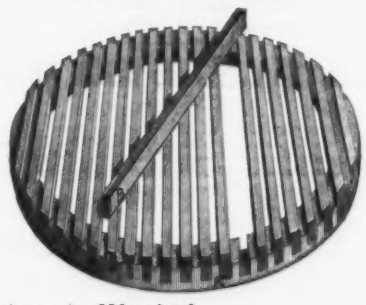
Manufactured by
BLAIR MFG. CO.,
Springfield, Mass.



Medium Size "NEW EASY."

THE LOVEGROVE WROUGHT-IRON GRATE BARS

FOR VERTICAL BOILERS.



Agents Wanted.

LOVEGROVE & CO.,
PHILADELPHIA.

Cheapest Patents Obtained in America.

Special facilities. Finest Drawings. Indisputable Claims. NO PATENT, NO PAY. Good Patents sold.

GLOBE PATENT OFFICE,
34 Park Row.

THE NEPTUNE FLEXIBLE JET and SPRAY HOSE NOZZLE.



All Rubber! Indestructible! Solid Stream! Instantly changed to spray by simply compressing the Soft Rubber Tip. The enlarged opening at the Tip produces spray, widely diffused or closely concentrated at will of user. The cheapest and best for Carriage Washing, Greenhouses, Gardens, Street Watering, &c. Sells at sight. Send for Circular. Enclose 35 cents for sample by mail to trade only.

The Hartford Rubber Works, Hartford Conn. Rubber Goods for Mechanical purposes. Fine and accurate mould work to order.



BECKER'S Patent Washing Machine. Improved, approach near the old method of hand rubbing than any device yet introduced to the public. Easily worked and washes perfectly clean. Descriptive circulars and price lists mailed free. N. C. RAUGHMAR, YORK, Pa.

Mention this paper.

THE CHALLENGE SAW GUARD

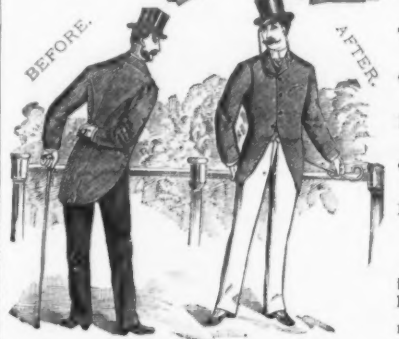
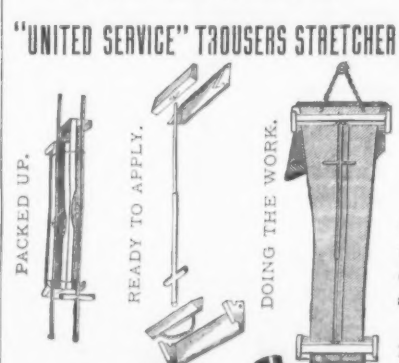
Is an absolute protection against all accidents from the Buzz saw, and is the BEST Guard Simplicity, Cheapness, and Safety made. WEB PARRY, Genl. Agt., RICHMOND, Ind.

MONCE'S NOVELTY GLASS CUTTERS are the Standard.

All Salable Styles made. Remember that we are the Originator of the Glass Cutter Wheel—Patents not yet expired—INTERCHANGEABLE LOCK SYSTEM.

S. G. Monce, Mfr., Bristol, Conn.

PATENTED IN EVERY NATION. THE ENGLISH "UNITED SERVICE" TROUSERS STRETCHER



NO MORE BAGGY KNEES.

WHOLESALE DEPOT, J. C. McCARTY & CO.,

97 Chambers Street, New York.

Trade Lists and Circulars on application.

The patentees of the "United Service" Trousers Stretcher desire to call attention to their great advantages, and have every confidence in recommending them as a very useful and economical invention.

BY THEIR USE OLD TROUSERS APPEAR LIKE NEW.

THE GENTLE AND INCREASING TENSION DOES NO INJURY.

THERE IS NOTHING TO GET OUT OF ORDER.

THEY ARE PROPERLY AND QUICKLY ARRANGED.

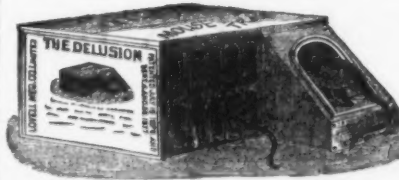
THEY ARE ADAPTED FOR THICK OR THIN MATERIAL.

THEY ARE THE CHEAPEST AND MOST EFFICIENT.

CAUTION—Legal proceedings will be taken against infringers, and vendors of the same will be prosecuted. Each Stretcher is patent stamped, without which none are genuine.

GREEN, CADBURY & CO.,
Patentees and Manufacturers,
BIRMINGHAM, ENGLAND.

The Delusion Mouse Trap.



The Mouse goes in to get the bait, And shuts the door by his own weight. And then he jumps right through a hole, And thinks he's out; but, bless his soul, He's in a cage, some how or other, And sets the trap to catch another.

Over Two Million of the Delusion Mouse Traps

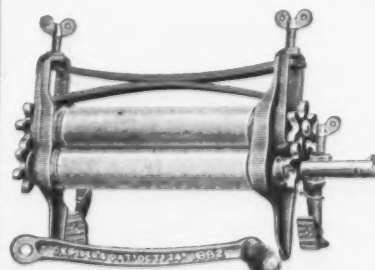
have been sold since it was put upon the market, and the sales are increasing rapidly each year. No better evidence could be produced to show that it exactly meets the wants of the public.

LOVELL MFG. CO., LIMITED, Erie, Pa.,
MANUFACTURERS OF

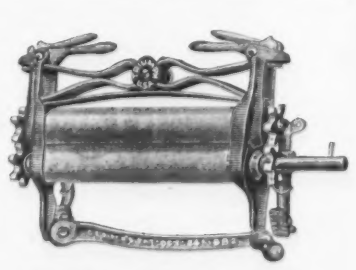
Clothes Wringers,

Delusion and Bonanza Mouse Traps,
The Folding Wire Rat Trap,
Erie Rat Trap, &c.

Send for Catalogue.



THE AMERICAN.



THE TRIUMPH.

In addition to the above Wringers we make the most durable Friction Wringer on the market, called "The Leader," which we make with or without Pressure Screws on top. All these Wringers are made of Galvanized Iron. The Shafts are of Steel, and Black Enamelled Handles, impervious to Alkali or Water. Warranted the Easiest Turning Wringers made, and to Wring Dry.

C. H. GURNEY & CO., 247 & 249 Lake St. & 7 & 9 Market St. Chicago, Ill.

AGENTS FOR THE NORTHWEST.

THE TRIUMPH WRINGER CO., - - KEENE, N. H.

LIESCHE'S

Burglar-Proof Sash Lock

AND

Automatic Window Holder.

Cheapest, Strongest and Only Practical Automatic Lock and Holder on the Market.

SAMPLES FREE TO THE TRADE.

J. R. CLANCY, Syracuse, N. Y.



FRUIT WINE & JELLY PRESS

SAUSAGE STUFFER

MOLASSES SELF MEASURING FAUCET

ENTERPRISE MFG. CO.
THIRD & DAUPHIN STS. PHILADELPHIA

Mrs. Potts' COLD HANDLE SADD IRONS

SELF WEIGHING CHEESE KNIFE

SOLD BY ALL HARDWARE DEALERS
SEND FOR ILLUSTRATED CATALOGUE FREE.

BUNG HOLE BORER TOBACCO

MEAT CHOPPER

BEF SHAVER

COFFEE MILL

SMOKED

NO. 20

AWARDED FIRST PREMIUM EVERYWHERE

FROM \$2 TO \$100

Twenty different sizes

HOSE AND PIPE COUPLING,



For Connecting all Sizes of Hose, Block Tin and Lead Pipe.

SIMPLE. CONVENIENT. DURABLE.

HOSE, 3-4 INCH, per dozen, - - - \$6.00
BEER AND ALE, per dozen, - - - 6.00
Discount on Application.

RAND, HARMER & CO.,

11th and Filbert Sts., - - PHILADELPHIA, PA.

THE SCRANTON HANGER FOR 1886.



The Simplest.
The Best Constructed.
The Most Artistic.
The Strongest.
The Closest Prices.
The Most Successful Anti-Friction Steel Hanger in the Market.
Handsome Models and Novel Advertising Matter for the Trade.

We Make the Only Complete Line of Hangers and their Fittings.

SEND FOR NEW CATALOGUE AND DISCOUNTS.

SCRANTON MFG. CO., 68 to 74 W. Monroe St., CHICAGO.

THE "SECURITY" DOOR HASP

No more losing the peg or slamming of barn doors. This securely fastens itself and you can use a padlock as well. Made of malleable iron and tinned. Staple and Screws with each one.

Send for Prices and Circular.



MANUFACTURED BY

SWEET & CLARK MFG. COMPY, TROY, N. Y.

LANE'S MEASURING FAUCET.

Price, \$3.00.

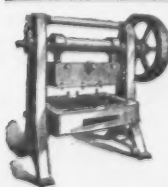
For Light or Heavy Molasses, Oils, Varnishes or other Fluids.

We warrant these Faucets to be as represented, measuring correctly and working more easily in heavy molasses than any Measuring Faucet in the market. No grocer can afford to be without them, for they save time, and "time is money." They insure perfect cleanliness, requiring no tin measures or funnel to collect dirt and draw flies. They do not drip. They prevent all waste, as no molasses or other fluid can pass except when the crank is turned. They are the embodiment of simplicity, and consequently they are always in order. They work easily in the heaviest molasses. They are warranted to measure correctly, according to U. S. Standard.

MANUFACTURED EXCLUSIVELY BY

LANE BROS., Poughkeepsie, N. Y.

General Agency, **JOHN H. GRAHAM & CO., 113 Chambers St., New York.**



FERRACUTE MACHINE CO.,

BRIDGETON, NEW JERSEY, U. S. A.,

Presses, Dies AND ALL OTHER Sheet Metal Tools.

Send for Illustrated Catalogue with sizes, weights and prices of 100 different kinds of Presses and Tools for

Cans, Tinware, Silver and Brass Goods, Locks, Hardware and other Iron Goods. A new line of Punching Presses just out.

B. KREISCHER & SONS, FIRE BRICK.

BEST AND CHEAPEST.

ESTABLISHED 1845.

1000, foot of Houston Street, East River, NEW YORK.

NEWTON & CO., ALBANY, N. Y.,

MANUFACTURERS OF BEST QUALITY

FIRE BRICK
And STOVE LININGS.

A. D. VALENTINE & BRO.,

MANUFACTURERS OF

FIRE BRICK
And FURNACE BLOCKS.

DRAIN PIPE AND LAND TILE,
Woodbridge, N. J.

BORGNER & O'BRIEN, FIRE BRICK

MANUFACTURERS

Edge Pressed Furnace Blocks,
Clay Retorts, Tiles, &c.

Twenty-third Street, Above Race, PHILADELPHIA.

Twenty years' practical experience.

ESTABLISHED 1845.
TROY FIRE BRICK WORKS,

James Ostrander & Son, FIRE BRICK,

Tiles, Blast Furnace Blocks, &c., and in a Special Department Linings for Stoves, Ranges and Heaters of superior quality. Miners of and dealers in Woodbridge, N. J., Fire Clay and Fire Sand and State Island Kaolin.

ESTABLISHED 1864.
JAMES GARDNER,

SUCCESSOR TO GARDNER BROS.,

MANUFACTURER OF
"STANDARD SAVAGE" FIRE BRICK,
TILE & FURNACE BLOCKS,

OF ALL SHAPES AND SIZES

Miner and Shipper of "Mount Savage" Fire Clay.

WORKS, Ellerslie, Allegheny Co., Md.

MAIN OFFICE, Cumberland, Md., P. O. Box 93.

BRANCH OFFICE, Pittsburgh, Pa., P. O. Box 373.

S. M. Hamilton & Co., Agents, Baltimore, Md.

UNION MINING COMPANY.

MOUNT SAVAGE FIRE BRICK.

EDWARD J. EITING, Agent

Eastern Penna., West New Jersey and Delaware.

222 South Third St., Philadelphia, Pa.

BIRMINGHAM FIRE BRICK WORKS.

All dimensions of Firebricks and Shapes, Fire Clay for Furnaces, Coke Ovens, Boilers and Patent Grate Linings. Drain Tile, Street Paving Blocks and Fire-Proof Hollow Bricks for Buildings.

BIRMINGHAM, ALA.

AIKIN & LIGHTON,
Iron City Foundry and Machine Works.

SOLE MANUFACTURERS OF

ARMON'S IMPROVED

SAND MOLDING MACHINE

BIRMINGHAM, ALABAMA.

CORRESPONDENCE SOLICITED.

CARRIAGE HARDWARE.

LARGEST LINE OF

WROUGHT CARRIAGE FORGING

MADE BY ANY HOUSE.

Send for Catalogue and Discount Sheet.

The E. D. CLAPP MFG. CO.,

AUBURN, N. Y.

Self-Binders for The Iron Age.

PRICES.

Full Cloth, \$1.25

Half Roan, \$1.50

The Iron Age Self-Binder.

We are now prepared to supply our subscribers with an excellent self-binder for their papers, a cut of which is annexed. We call attention to the low prices at which it is offered. Address all orders to

DAVID WILLIAMS,

66 and 68 Duane Street, New York.

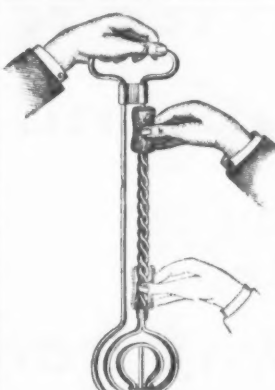
Plow Colters, Blades and Hubs.

Adjustable, Caster, Stationary.

All Kinds and Sizes.

GEO. K. OYLER MFG. CO.,
ST. LOUIS, MO., U. S. A.

Write for Catalogue.



It is Second to no Beater Made.

For the convenience of the Trade we publish the subjoined list, which explains itself. If any dealer doubts the worth of this Beater, let him write for opinion of any one on this list.

PHILADELPHIA, PA., U. S. A., May 26, 1886.

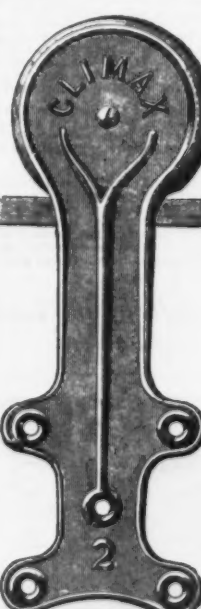
DEAR SIR:

In reply to your inquiry we hand you the enclosed list of jobbers who are in a better position to serve you with Bryant's Patent Egg Beaters than we are, as they have (and keep) a stock of these goods. If you order from your jobber he may have them, as this list is only correct to date.

Truly,

PAINE, DIEHL & CO.

ALBANY—W. T. Burgess.
Hoy & Co.
Lansing Bros.
OHIO.
CINCINNATI—F. H. Lawson & Co.
Cincinnati Tin & Japan Co.
Gibson, W. & Co.
Geo. D. Winchell Mfg. Co.
Kruse & Rahman.
L. D. Ault.
Wm. R. Ham & Co.
Geo. Worthington & Co.
COLUMBUS—J. Abbott & Co.
McNee, Louis & Griswold.
OREGON.
PORTLAND—Hexter & May.
Thompson, DeHart & Co.
Goldsmith & Lowenbete.
PENNSYLVANIA.
PHILADELPHIA—Hall & Carpenter.
Gumme, Spiering.
Ingram & Co.
J. M. Melloy's Sons.
N. & G. Taylor Co.
Lloyd & Supplee.
Hardware Co.
Biddle Hdw. Co.
Edw. Darby & Sons.
Hackett, Flanagan & Co.
C. B. Porter & Co.
H. A. Willes.
PITTSBURGH—Logan, Grege & Co.
Fleming & Hamilton.
Wolff, Lane & Co.
Bridley Hardware Co.
L. H. Smith Wooder.
Ware Co.
Ludsey, Sterritt & Co.
J. B. Scott & Co.
G. W. Stevenson & Co.
Denner Bros.
John Dunlap.
RHODE ISLAND.
PROVIDENCE—E. T. George & Co.
Barker, Chadsey & Co.
TEXAS.
EL PASO—Henry Bencke.
UTAH.
SALT LAKE CITY—Zion Co. O & Mer.
Insti.
Geo. M. Scott & Co.
CUMMINGTON & Co.
WISCONSIN.
MILWAUKEE—John Fritzlaiff Hdw.
Wm. Frankfurth Hdw. Co., Limited.



"CLIMAX"

Barn Door Hangers,

"ZENITH"

Barn Door Hangers,

FOR WOOD TRACK.

Moore's Freight Car

Door Hangers,

Baggage Car Door

Hangers,

RAILROAD HANGERS,

Parlor Door Hangers.

Send for New Price Lists.

Moore Mfg Co.,

165 Lake St.,

CHICAGO.



AMERICAN CUTLERY CO.,

MANUFACTURERS OF



FINEST

QUALITY

CARVERS

TABLE CUTLERY,

BUTCHER, COOK AND CARVING KNIVES,

177 to 191 Mather Street, - - - CHICAGO.

WRITE FOR CATALOGUES.

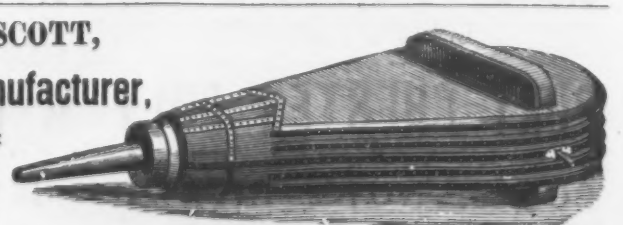
GEO. M. SCOTT,

Bellows Manufacturer,

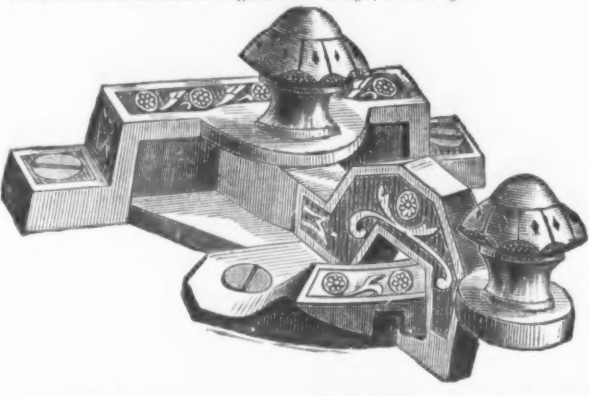
Johnson Street

Cor. 22d St.,

CHICAGO, ILL.



For Net Bottom Prices see Page Adv. Iron Age, APRIL 15th.

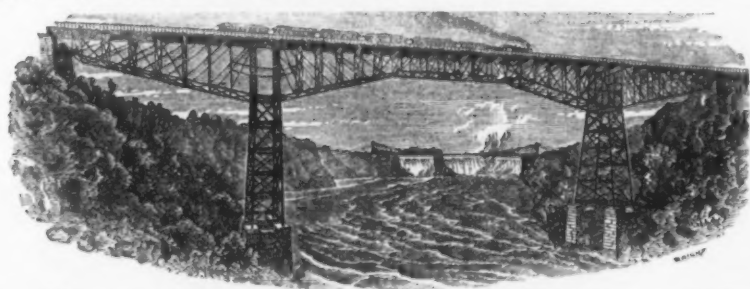
BURGLAR-PROOF SASH LOCKS.Patented Oct. 27th, 1879.
FOR NET BOTTOM PRICES SEE PAGE AD.
IN IRON AGE, APRIL 15th.

No. 210, Ornamental Iron, Iron Knob, fine finish, \$0.60	No. 21, Ornamental Iron, Iron Knob, Nickel-plated, Crimson Old Gold Inlaid, 1.85
No. 211, Ornamental Iron, Iron Knob, fine finish, \$0.75	No. 215, Ornamental Iron, Iron Knob, Nickel-plated, Blue Old Gold Inlaid, 1.00
No. 212, Ornamental Iron, Iron Knob, fine finish, \$0.85	No. 216, Ornamental Iron, Iron Knob, Nickel-plated, Green Old Gold Inlaid, 1.95
No. 213, Ornamental Iron, Iron Knob, Nickel-plated, \$1.35	No. 220, Ornamental Iron, Iron Knob, Nickel-plated, Copper Old Gold Inlaid, 2.00
No. 214, Ornamental Iron, Iron Knob, Nickel-plated, Rich Old Gold Inlaid, 1.50	No. 221, Ornamental Iron, Iron Knob, Nickel-plated, Lemon Oil Gold Inlaid, 2.05
No. 215, Ornamental Iron, Iron Knob, Nickel-plated, Pale Old Gold Inlaid, 1.60	No. 222, Ornamental Cast Brass, Polished and Lacquered, 2.05
No. 216, Ornamental Iron, Iron Knob, Nickel-plated, Fire Old Gold Inlaid, 1.75	No. 223, Ornamental Cast Brass, Nickel-plated, 3.50

MANHATTAN HARDWARE CO.,

READING, PA., U. S. A.
MANUFACTURERS OF
LOCKS of Every Description,
AND A FULL LINE OF
GENERAL BUILDERS' HARDWARE.

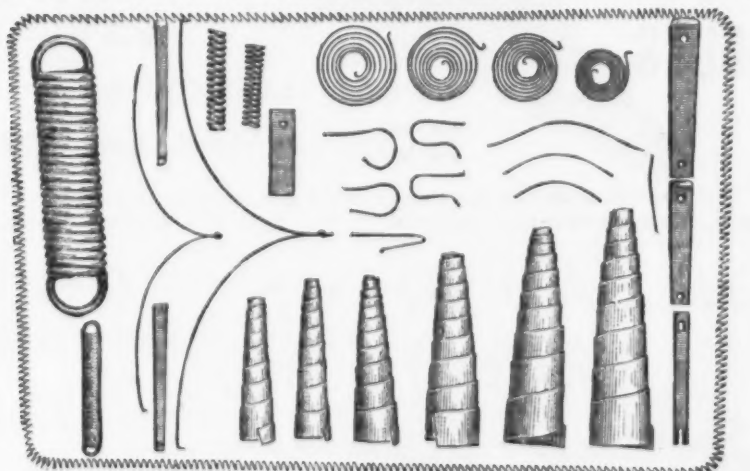
Special net prices to be found in *Iron Age* whenever changes occur.
The only manufacturers in the United States who quote bottom prices to all dealers without favoring any class.
Fine Gray Iron Castings of every description, also Real Bronze and Brass Castings, made to order at very low prices. Pattern Making, Japanning, Bronzing, Tinning, &c.
Our goods are known and liked wherever sold.
Orders received will be filled at last prices quoted in *The Iron Age*.
We do no underhand business, but quote alike to all for quantities less than \$1000.
Our terms are strictly 15 days, f. o. b. Reading, no charge for cases or cartage.

UNION BRIDGE COMPANY.

Charles Kellogg, Thos. C. Clarke, C. B. Maurice, Geo. S. Field, Edmund Hayes, C. Macdonald.
CIVIL ENGINEERS
And Constructors of Iron and Steel Bridges, Viaducts, Roofs, Elevated Railroads, Marine Piers, Etc.

Works: Athens, Pa. Works: Buffalo, N. Y.
Late Kellogg & Maurice, Capacity, 14,000 tons. (Late Central Bridge Works.) Capacity, 12,000 tons.
DESIGNS AND ESTIMATES WILL BE SENT ON APPLICATION TO

UNION BRIDGE COMPANY, 18 Broadway, New York.

Sabin Machine Co.,

MANUFACTURERS OF

SPECIAL SPRINGS FOR MACHINERY AND VARIOUS OTHER PURPOSES.

SABIN'S LEVER DOOR SPRINGS & SPRING BUTTS.

Sabin's celebrated *Valute Springs*, light, with great amount of action, and the most durable Spring made. Special springs made to order. Send for prices and catalogue.

SABIN MACHINE CO.,
MONTPELIER, VT.

PATENT GRANTED.

Will extract the last drop of juice from lemon still, 1/2 to 1 more and better juice than any squeezer, extracting none of the poison from the rind. Is worth more than three of the best squeezers and sells for 10 cents. Wash as soon as used. Sent by mail on receipt of 10 cents in 2 cent stamps, or \$1.00 per dozen. Large discount to the trade. Ask your Wholesale Trade and Jobbers for them. Agents Wanted. They sell at sight. Sent by mail only to those sending in cents in stamps. All orders or communications should be addressed to the Patentee and Sole Manufacturer.

BURLINGTON, VT., Sept. 3, 1885.

Dear Sir: I have used and am selling your Lemon Drill, and consider it the best article for extracting the juice from lemons that I have ever seen. My customers are very much pleased with them.

W. B. McKILLIP, Grocer.

BURLINGTON, VT., Dec. 20, 1884.

Dear Sir: I am using one of your Lemon Drills and am very much pleased with it. I think it an article every housekeeper will appreciate when tried.

Mrs. C. H. MORRISON.

W. F. MOUTON, Burlington, Vt.

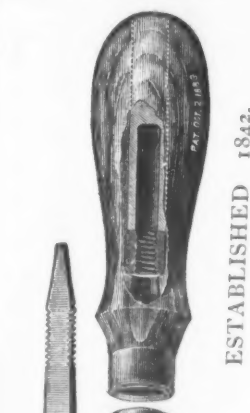
**THE NEW GIANT DRILL CHUCK**

Holds a Drill With the Grip of a Giant. All Steel.

Paris Interchangeable SIMPLE IN CONSTRUCTION.

EASY TO TAKE APART AND CLEAN. BEST OF WORKMANSHIP AND VERY CHEAP. Manufactured and sold by

THE SMITH & EGGE MFG. CO., Bridgeport, Conn.

**PATENT SCREW TANG**

As a guarantee of the superior quality of Screw Tang Files over all others, for any that are unsatisfactory as to temper, &c., we will give in exchange two for each one that is returned to us. One Handle will last a lifetime in constant use, making it the cheapest Handle in the world. Cost 10 cents each.

ESTABLISHED 1842.

J. BARTON SMITH CO.,

Philadelphia, Pa., U. S. A.

GILBERT PARKER, President.

S. A. HAINES & CO., Agents, 90 Chambers St., New York.

THE PERFECT DOOR SPRING.

Cheap, Simple, Durable, Effective.

FOR LIGHT AND HEAVY DOORS.

Indorsed by the Trade.



Made in four sizes of the best Crucible Steel Wire. The smaller sizes have no equal for screen and other light doors.
COILED WIRE BELTING CO., 93 CHURCH ST., NEW YORK.



J.F. WOLLENSAK'S PATENT TRANSOM LIFTER AND LOCK FOR ALL KINDS OF TRANSOMS, PANLIGHTS, SKYLIGHTS.

SEND FOR CATALOGUE AND PRICE LIST.

J.F. WOLLENSAK, PATENTEE AND SOLE MANUFACTURER, CHICAGO, ILL.

J.F. WOLLENSAK'S PATENT TRANSOM LIFTER AND LOCK FOR ALL KINDS OF TRANSOMS, PANLIGHTS, SKYLIGHTS.

SEND FOR CATALOGUE AND PRICE LIST.

J.F. WOLLENSAK, PATENTEE AND SOLE MANUFACTURER, CHICAGO, ILL.

J.F. WOLLENSAK'S PATENT TRANSOM LIFTER AND LOCK FOR ALL KINDS OF TRANSOMS, PANLIGHTS, SKYLIGHTS.

SEND FOR CATALOGUE AND PRICE LIST.

J.F. WOLLENSAK, PATENTEE AND SOLE MANUFACTURER, CHICAGO, ILL.

J.F. WOLLENSAK'S PATENT TRANSOM LIFTER AND LOCK FOR ALL KINDS OF TRANSOMS, PANLIGHTS, SKYLIGHTS.

SEND FOR CATALOGUE AND PRICE LIST.

J.F. WOLLENSAK, PATENTEE AND SOLE MANUFACTURER, CHICAGO, ILL.

J.F. WOLLENSAK'S PATENT TRANSOM LIFTER AND LOCK FOR ALL KINDS OF TRANSOMS, PANLIGHTS, SKYLIGHTS.

SEND FOR CATALOGUE AND PRICE LIST.

J.F. WOLLENSAK, PATENTEE AND SOLE MANUFACTURER, CHICAGO, ILL.

J.F. WOLLENSAK'S PATENT TRANSOM LIFTER AND LOCK FOR ALL KINDS OF TRANSOMS, PANLIGHTS, SKYLIGHTS.

SEND FOR CATALOGUE AND PRICE LIST.

J.F. WOLLENSAK, PATENTEE AND SOLE MANUFACTURER, CHICAGO, ILL.

J.F. WOLLENSAK'S PATENT TRANSOM LIFTER AND LOCK FOR ALL KINDS OF TRANSOMS, PANLIGHTS, SKYLIGHTS.

SEND FOR CATALOGUE AND PRICE LIST.

J.F. WOLLENSAK, PATENTEE AND SOLE MANUFACTURER, CHICAGO, ILL.

J.F. WOLLENSAK'S PATENT TRANSOM LIFTER AND LOCK FOR ALL KINDS OF TRANSOMS, PANLIGHTS, SKYLIGHTS.

SEND FOR CATALOGUE AND PRICE LIST.

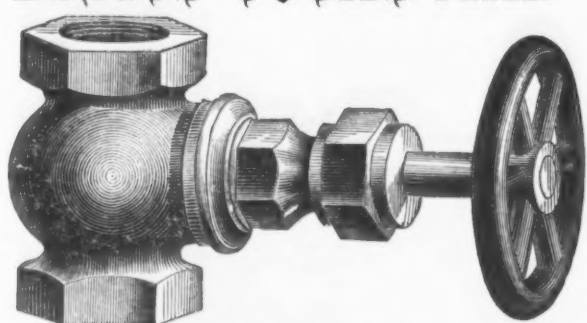
J.F. WOLLENSAK, PATENTEE AND SOLE MANUFACTURER, CHICAGO, ILL.

BOSTON.

Reported by Bigelow & Dwyer.

Ammunition.	
Cartridges—	
Rim Fire Military Cartridges, .30	dis 60
Rim Fire Military Cartridges, .45	dis 10
Cent. Fire Cartridges, Pistol and Rifle, .45	dis 40
Cent. Fire Cartridges, Military and Sporting, .30	dis 30
Blank Cartridges, except 22 and 25 cal., an additional 10% over above discounts.	
Blank Cartridges, 22 cal.	\$1.50
Blank Cartridges, 25 cal.	3.00
Primed Shells and Bullets, .25	dis 25
R. B. Caps, Round Ball, .10	
R. B. Caps, Conical Ball, Swaged, 1.75	
Primers.	
Berdan Primers, all sizes, and B. L. Caps (for Sturtevant Shells), .90	
All other Primers, all sizes, .10	\$1.10
Shells.	
Paper Shot Shells, 1st and 2d or S. G. qual., .25	dis 25
Paper Shot Shells, Club, Rival, Climax, .45	dis 45
Paper Shot Shells, Star Brand, .50	dis 50
Brass Shot Shells, 1st quality, .45	dis 45
Brass Shot Shells, Club, Rival and Climax, .65	dis 65
Wads.	
U. M. C. & W. R. A. - B. E., 11 up, .20	
U. M. C. & W. R. A. - B. E., 9 & 10, .20	
U. M. C. & W. R. A. - B. E., 7 & 8, .20	dis
U. M. C. & W. R. A. - P. E., 11 up, .30	
U. M. C. & W. R. A. - P. E., 9 & 10, .40	
U. M. C. & W. R. A. - P. E., 7 & 8, .40	4.00
Anvil & Vice.	
Cheney, .50 20 30 40	dis 25
Eagle, Fisher & Norris, No. 00, \$1.75; 0, \$2.25; 1, \$2.75; 2, \$3.25; 3, \$4.00; 4, \$4.50; 5, \$5.00; 6, \$5.50; 7, \$6.00; 8, \$6.50; 9, \$7.00; 10, \$7.50; 11, \$8.00; 12, \$8.50; 13, \$9.00; 14, \$9.50; 15, \$10.00; 16, \$10.50; 17, \$11.00; 18, \$11.50; 19, \$12.00; 20, \$12.50; 21, \$13.00; 22, \$13.50; 23, \$14.00; 24, \$14.50; 25, \$15.00; 26, \$15.50; 27, \$16.00; 28, \$16.50; 29, \$17.00; 30, \$17.50; 31, \$18.00; 32, \$18.50; 33, \$19.00; 34, \$19.50; 35, \$20.00; 36, \$20.50; 37, \$21.00; 38, \$21.50; 39, \$22.00; 40, \$22.50; 41, \$23.00; 42, \$23.50; 43, \$24.00; 44, \$24.50; 45, \$25.00; 46, \$25.50; 47, \$26.00; 48, \$26.50; 49, \$27.00; 50, \$27.50; 51, \$28.00; 52, \$28.50; 53, \$29.00; 54, \$29.50; 55, \$30.00; 56, \$30.50; 57, \$31.00; 58, \$31.50; 59, \$32.00; 60, \$32.50; 61, \$33.00; 62, \$33.50; 63, \$34.00; 64, \$34.50; 65, \$35.00; 66, \$35.50; 67, \$36.00; 68, \$36.50; 69, \$37.00; 70, \$37.50; 71, \$38.00; 72, \$38.50; 73, \$39.00; 74, \$39.50; 75, \$40.00; 76, \$40.50; 77, \$41.00; 78, \$41.50; 79, \$42.00; 80, \$42.50; 81, \$43.00; 82, \$43.50; 83, \$44.00; 84, \$44.50; 85, \$45.00; 86, \$45.50; 87, \$46.00; 88, \$46.50; 89, \$47.00; 90, \$47.50; 91, \$48.00; 92, \$48.50; 93, \$49.00; 94, \$49.50; 95, \$50.00; 96, \$50.50; 97, \$51.00; 98, \$51.50; 99, \$52.00; 100, \$52.50; 101, \$53.00; 102, \$53.50; 103, \$54.00; 104, \$54.50; 105, \$55.00; 106, \$55.50; 107, \$56.00; 108, \$56.50; 109, \$57.00; 110, \$57.50; 111, \$58.00; 112, \$58.50; 113, \$59.00; 114, \$59.50; 115, \$60.00; 116, \$60.50; 117, \$61.00; 118, \$61.50; 119, \$62.00; 120, \$62.50; 121, \$63.00; 122, \$63.50; 123, \$64.00; 124, \$64.50; 125, \$65.00; 126, \$65.50; 127, \$66.00; 128, \$66.50; 129, \$67.00; 130, \$67.50; 131, \$68.00; 132, \$68.50; 133, \$69.00; 134, \$69.50; 135, \$70.00; 136, \$70.50; 137, \$71.00; 138, \$71.50; 139, \$72.00; 140, \$72.50; 141, \$73.00; 142, \$73.50; 143, \$74.00; 144, \$74.50; 145, \$75.00; 146, \$75.50; 147, \$76.00; 148, \$76.50; 149, \$77.00; 150, \$77.50; 151, \$78.00; 152, \$78.50; 153, \$79.00; 154, \$79.50; 155, \$80.00; 156, \$80.50; 157, \$81.00; 158, \$81.50; 159, \$82.00; 160, \$82.50; 161, \$83.00; 162, \$83.50; 163, \$84.00; 164, \$84.50; 165, \$85.00; 166, \$85.50; 167, \$86.00; 168, \$86.50; 169, \$87.00; 170, \$87.50; 171, \$88.00; 172, \$88.50; 173, \$89.00; 174, \$89.50; 175, \$90.00; 176, \$90.50; 177, \$91.00; 178, \$91.50; 179, \$92.00; 180, \$92.50; 181, \$93.00; 182, \$93.50; 183, \$94.00; 184, \$94.50; 185, \$95.00; 186, \$95.50; 187, \$96.00; 188, \$96.50; 189, \$97.00; 190, \$97.50; 191, \$98.00; 192, \$98.50; 193, \$99.00; 194, \$99.50; 195, \$100.00; 196, \$100.50; 197, \$101.00; 198, \$101.50; 199, \$102.00; 200, \$102.50; 201, \$103.00; 202, \$103.50; 203, \$104.00; 204, \$104.50; 205, \$105.00; 206, \$105.50; 207, \$106.00; 208, \$106.50; 209, \$107.00; 210, \$107.50; 211, \$108.00; 212, \$108.50; 213, \$109.00; 214, \$109.50; 215, \$110.00; 216, \$110.50; 217, \$111.00; 218, \$111.50; 219, \$112.00; 220, \$112.50; 221, \$113.00; 222, \$113.50; 223, \$114.00; 224, \$114.50; 225, \$115.00; 226, \$115.50; 227, \$116.00; 228, \$116.50; 229, \$117.00; 230, \$117.50; 231, \$118.00; 232, \$118.50; 233, \$119.00; 234, \$119.50; 235, \$120.00; 236, \$120.50; 237, \$121.00; 238, \$121.50; 239, \$122.00; 240, \$122.50; 241, \$123.00; 242, \$123.50; 243, \$124.00; 244, \$124.50; 245, \$125.00; 246, \$125.50; 247, \$126.00; 248, \$126.50; 249, \$127.00; 250, \$127.50; 251, \$128.00; 252, \$128.50; 253, \$129.00; 254, \$129.50; 255, \$130.00; 256, \$130.50; 257, \$131.00; 258, \$131.50; 259, \$132.00; 260, \$132.50; 261, \$133.00; 262, \$133.50; 263, \$134.00; 264, \$134.50; 265, \$135.00; 266, \$135.50; 267, \$136.00; 268, \$136.50; 269, \$137.00; 270, \$137.50; 271, \$138.00; 272, \$138.50; 273, \$139.00; 274, \$139.50; 275, \$140.00; 276, \$140.50; 277, \$141.00; 278, \$141.50; 279, \$142.00; 280, \$142.50; 281, \$143.00; 282, \$143.50; 283, \$144.00; 284, \$144.50; 285, \$145.00; 286, \$145.50; 287, \$146.00; 288, \$146.50; 289, \$147.00; 290, \$147.50; 291, \$148.00; 292, \$148.50; 293, \$149.00; 294, \$149.50; 295, \$150.00; 296, \$150.50; 297, \$151.00; 298, \$151.50; 299, \$152.00; 300, \$152.50; 301, \$153.00; 302, \$153.50; 303, \$154.00; 304, \$154.50; 305, \$155.00; 306, \$155.50; 307, \$156.00; 308, \$156.50; 309, \$157.00; 310, \$157.50; 311, \$158.00; 312, \$158.50; 313, \$159.00; 314, \$159.50; 315, \$160.00; 316, \$160.50; 317, \$161.00; 318, \$161.50; 319, \$162.00; 320, \$162.50; 321, \$163.00; 322, \$163.50; 323, \$164.00; 324, \$164.50; 325, \$165.00; 326, \$165.50; 327, \$166.00; 328, \$166.50; 329, \$167.00; 330, \$167.50; 331, \$168.00; 332, \$168.50; 333, \$169.00; 334, \$169.50; 335, \$170.00; 336, \$170.50; 337, \$171.00; 338, \$171.50; 339, \$172.00; 340, \$172.50; 341, \$173.00; 342, \$173.50; 343, \$174.00; 344, \$174.50; 345, \$175.00; 346, \$175.50; 347, \$176.00; 348, \$176.50; 349, \$177.00; 350, \$177.50; 351, \$178.00; 352, \$178.50; 353, \$179.00; 354, \$179.50; 355, \$180.00; 356, \$180.50; 357, \$181.00; 358, \$181.50; 359, \$182.00; 360, \$182.50; 361, \$183.00; 362, \$183.50; 363, \$184.00; 364, \$184.50; 365, \$185.00; 366, \$185.50; 367, \$186.00; 368, \$186.50; 369, \$187.00; 370, \$187.50; 371, \$188.00; 372, \$188.50; 373, \$189.00; 374, \$189.50; 375, \$190.00; 376, \$190.50; 377, \$191.00; 378, \$191.50; 379, \$192.00; 380, \$192.50; 381, \$193.00; 382, \$193.50; 383, \$194.00; 384, \$194.50; 385, \$195.00; 386, \$195.50; 387, \$196.00; 388, \$196.50; 389, \$197.00; 390, \$197.50; 391, \$198.00; 392, \$198.50; 393, \$199.00; 394, \$199.50; 395, \$200.00; 396, \$200.50; 397, \$201.00; 398, \$201.50; 399, \$202.00; 400, \$202.50; 401, \$203.00; 402, \$203.50; 403, \$204.00; 404, \$204.50; 405, \$205.00; 406, \$205.50; 407, \$206.00; 408, \$206.50; 409, \$207.00; 410, \$207.50; 411, \$208.00; 412, \$208.50; 413, \$209.00; 414, \$209.50; 415, \$210.00; 416, \$210.50; 417, \$211.00; 418, \$211.50; 419, \$212.00; 420, \$212.50; 421, \$213.00; 422, \$213.50; 423, \$214.00; 424, \$214.50; 425, \$215.00; 426, \$215.50; 427, \$216.00; 428, \$216.50; 429, \$217.00; 430, \$217.50; 431, \$218.00; 432, \$218.50; 433, \$219.00; 434, \$219.50; 435, \$220.00; 436, \$220.50; 437, \$221.00; 438, \$221.50; 439, \$222.00; 440, \$222.50; 441, \$223.00; 442, \$223.50; 443, \$224.00; 444, \$224.50; 445, \$225.00; 446, \$225.50; 447, \$226.00; 448, \$226.50; 449, \$227.00; 450, \$227.50; 451, \$228.00; 452, \$228.50; 453, \$229.00; 454, \$229.50; 455, \$230.00; 456, \$230.50; 457, \$231.00; 458, \$231.50; 459, \$232.00; 460, \$232.50; 461, \$233.00; 462, \$233.50; 463, \$234.00; 464, \$234.50; 465, \$235.00; 466, \$235.50; 467, \$236.00; 468, \$236.50; 469, \$237.00; 470, \$237.50; 471, \$238.00; 472, \$238.50; 473, \$239.00; 474, \$239.50; 475, \$240.00; 476, \$240.50; 477, \$241.00; 478, \$241.50; 479, \$242.00; 480, \$242.50; 481, \$243.00; 482, \$243.50; 483, \$244.00; 484, \$244.50; 485, \$245.00; 486, \$245.50; 487, \$246.00; 488, \$246.50; 489, \$247.00; 490, \$247.50; 491, \$248.00; 492, \$248.50; 493, \$249.00; 494, \$249.50; 495, \$250.00; 496, \$250.50; 497, \$251.00; 498, \$251.50; 499, \$252.00; 500, \$252.50; 501, \$253.00; 502, \$253.50; 503, \$254.00; 504, \$254.50; 505, \$255.00; 506, \$255.50; 507, \$256.00; 508, \$256.50; 509, \$257.00; 510, \$257.50; 511, \$258.00; 512, \$258.50; 513, \$259.00; 514, \$259.50; 515, \$260.00; 516, \$260.50; 517, \$261.00; 518, \$261.50; 519, \$262.00; 520, \$262.50; 521, \$263.00; 522, \$263.50; 523, \$264.00; 524, \$264.50; 525, \$265.00; 526, \$265.50; 527, \$266.00; 528, \$266.50; 529, \$267.00; 530, \$267.50; 531, \$268.00; 532, \$268.50; 533, \$269.00; 534, \$269.50; 535, \$270.00; 536, \$270.50; 537, \$271.00; 538, \$271.50; 539, \$272.00; 540, \$272.50; 541, \$273.00; 542, \$273.50; 543, \$274.00; 544, \$274.50; 545, \$275.00; 546, \$275.50; 547, \$276.00; 548, \$276.50; 549, \$277.00; 550, \$277.50; 551, \$278.00; 552, \$278.50; 553, \$279.00; 554, \$279.50; 555, \$280.00; 556, \$280.50; 557, \$281.00; 558, \$281.50; 559, \$282.00; 560, \$282.50; 561, \$283.00; 562, \$283.50; 563, \$284.00; 564, \$284.50; 565, \$285.00; 566, \$285.50; 567, \$286.00; 568, \$286.50; 569, \$287.00; 570, \$287.50; 571, \$288.00; 572, \$288.50; 573, \$289.00; 574, \$289.50; 575, \$290.00; 576, \$290.50; 577, \$291.00; 578, \$291.50; 579, \$292.00; 580, \$292.50; 581, \$293.00; 582, \$293.50; 583, \$294.00; 584, \$294.50; 585, \$295.00; 586, \$295.50; 587, \$296.00; 588, \$296.50; 589, \$297.00; 590, \$297.50; 591, \$298.00; 592, \$298.50; 593, \$299.00; 594, \$299.50; 595, \$300.00; 596, \$300.50; 597, \$301.00; 598, \$301.50; 599, \$302.00; 600, \$302.50; 601, \$303.00; 602, \$303.50; 603, \$304.00; 604, \$304.50; 605, \$305.00; 606, \$305.50; 607, \$306.00; 608, \$306.50; 609, \$307.00; 610, \$307.50; 611, \$308.00; 612, \$308.50; 613, \$309.00; 614, \$309.50; 615, \$310.00; 616, \$310.50; 617, \$311.00; 618, \$311.50; 619, \$312.00; 620, \$312.50; 621, \$313.00; 622, \$313.50; 623, \$314.00; 624, \$314.50; 625, \$315.00; 626, \$315.50; 627, \$316.00; 628, \$316.50; 629, \$317.00; 630, \$317.50; 631, \$318.00; 632, \$318.50; 633, \$319.00; 634, \$319.50; 635, \$320.00; 636, \$320.50; 637, \$321.00; 638, \$321.50; 639, \$322.00; 640, \$322.50; 641, \$323.00; 642, \$323.50; 643, \$324.00; 644, \$324.50; 645, \$325.00; 646, \$325.50; 647, \$326.00; 648, \$326.50; 649, \$327.00; 650, \$327.50; 651, \$328.00; 652, \$328.50; 653, \$329.00; 654, \$329.50; 655, \$330.00; 656, \$330.50; 657, \$331.00; 658, \$331.50; 659, \$332.00; 660, \$332.50; 661, \$333.00; 662, \$333.50; 663, \$334.00; 664, \$334.50; 665, \$335.00; 666, \$335.50; 667, \$336.00; 668, \$336.50; 669, \$337.00; 670, \$337.50; 671, \$338.00; 672, \$338.50; 673, \$339.00; 674, \$339.50; 675, \$340.00; 676, \$340.50; 677, \$341.00; 678, \$341.50; 679, \$342.00; 680, \$342.50; 681, \$343.00; 682, \$343.50; 683, \$344.00; 684, \$344.50; 685, \$345.00; 686, \$345.50; 687, \$346.00; 688, \$346.50; 689, \$347.00; 690, \$347.50; 691, \$348.00; 692, \$348.50; 693, \$349.00; 694, \$349.50; 695, \$350.00; 696, \$350.50; 697, \$351.00; 698, \$351.50; 699, \$352.00; 700, \$352.50; 701, \$353.00; 702, \$353.50; 703, \$354.00; 704, \$354.50; 705, \$355.00; 706, \$355.50; 707, \$356.00; 708, \$356.50; 709, \$357.00; 710, \$357.50; 711, \$358.00; 712, \$358.50; 713, \$359.00; 714, \$359.50; 715, \$360.00; 716, \$360.50; 717, \$361.00; 718, \$361.50; 719, \$362.00; 720, \$362.50; 721, \$363.00; 722, \$363.50; 723, \$364.00; 724, \$364.50; 725, \$365.00; 726, \$365.50; 727, \$366.00; 728, \$366.50; 729, \$367.00; 730, \$367.50; 731, \$368.00; 732, \$368.50; 733, \$369.00; 734, \$369.50; 735, \$370.00; 736, \$370.50; 737, \$371.00; 738, \$371.50; 739, \$372.00; 740, \$372.50; 741, \$373.00; 742, \$373.50; 743, \$374.00; 744, \$374.50; 745, \$375.00; 746, \$375.50; 747, \$376.00; 748, \$376.50; 749, \$377.00; 750, \$377.50; 751, \$378.00; 752, \$378.50; 753, \$379.00; 754, \$379.50; 755, \$380.00; 756, \$380.50; 757, \$381.00; 758, \$381.50; 759, \$382.00; 760, \$382.50; 761, \$383.00; 762, \$383.50; 763, \$384.00; 764, \$384.50; 765, \$385.00; 766, \$385.50; 767, \$386.00; 768, \$386.50; 769, \$387.00; 770, \$387.50; 771, \$388.00; 772, \$388.50; 773, \$389.00; 774, \$389.50; 775, \$390.00; 776, \$390.50; 777, \$391.00; 778, \$391.50; 779, \$392.00; 780, \$392.50; 781, \$393.00; 782, \$393.50; 783, \$394.00; 784, \$394.50; 785, \$395.00; 786, \$395.50; 787, \$396.00; 788, \$396.50; 789, \$397.00; 790, \$397.50; 791, \$398.00; 792, \$398.50; 793, \$399.00; 794, \$399.50; 795, \$400.00; 796, \$400.50; 797, \$401.00; 798, \$401.50; 799, \$402.00; 800, \$402.50; 801, \$403.00; 802, \$403.50; 803, \$404.00; 804, \$404.50; 805, \$405.00; 806, \$405.50; 807, \$406.00; 808, \$406.50; 809, \$407.00; 810, \$407.50; 811, \$408.00; 812, \$408.50; 813, \$409.00; 814, \$409.50; 815, \$410.00; 816, \$410.50; 817, \$411.00; 818, \$411.50; 819, \$412.00; 820, \$412.50; 821, \$413.00; 822, \$413.50; 823, \$414.00; 824, \$414.50; 825, \$415.00; 826, \$415.50; 827, \$416.00; 828, \$416.50; 829, \$417.00; 830, \$417.50; 831, \$418.00; 832, \$418.50; 833, \$419.00; 834, \$419.50; 835, \$420.00; 836, \$420.50; 837, \$421.00; 838, \$421.50; 839, \$422.00; 840, \$422.50; 841, \$423.00; 842, \$423.50; 843, \$424.00; 844, \$424.50; 845, \$425.00; 846, \$425.50; 847, \$426.00; 848, \$426.50; 849, \$427.00; 850, \$427.50; 851, \$428.00; 852, \$428.50; 853, \$429.00; 854, \$429.50; 855, \$430.00; 856, \$430.50; 857, \$431.00; 858, \$431.50; 859, \$432.00; 860, \$432.50; 861, \$433.00; 862, \$433.50; 863, \$434.00; 864, \$434.50; 865, \$435.00; 866, \$435.50; 867, \$436.00; 868, \$436.50; 869, \$437.00; 870, \$437.50; 871, \$438.00; 872, \$438.50; 873, \$439.00; 874, \$439.50; 875, \$440.00; 876, \$440.50; 877, \$441.00; 878, \$441.50; 879, \$442.00; 880, \$442.50; 881, \$443.00; 882, \$443.50; 883, \$444.00; 884, \$444.50; 885, \$445.00; 886, \$445.50; 887, \$446.00; 888, \$446.50; 889, \$447.00; 890, \$447.50; 891, \$448.00; 892, \$448.50; 893, \$449.00; 894, \$449.50; 895, \$450.00; 896, \$450.50; 897, \$451.00; 898, \$451.50; 899, \$452.00; 900, \$452.50; 901, \$453.00; 902, \$453.50;	

McNab & Harlin Mfg. Co., MANUFACTURERS OF BRASS COCKS AND VALVES



For Steam,
Water,
and Gas.

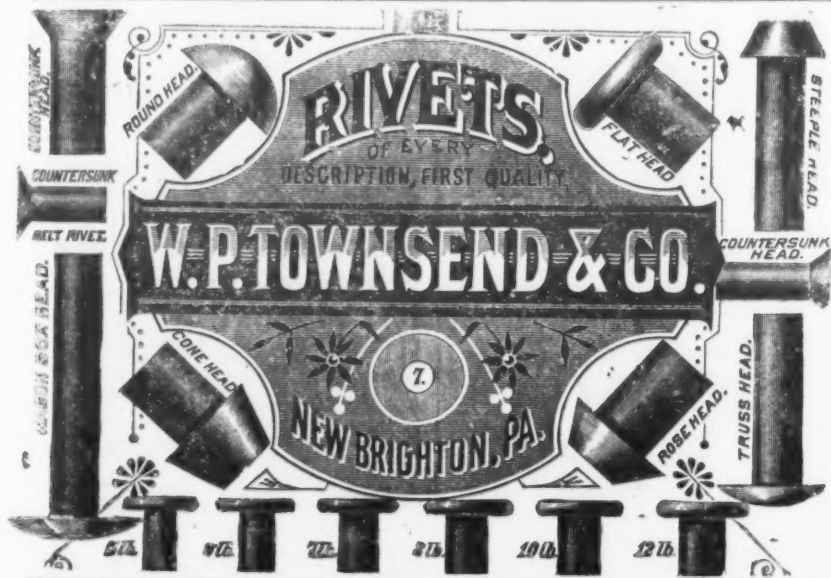
WROUGHT IRON
PIPE & FITTINGS

Plumbers'
Materials.

Factory, Paterson, N. J.

56 John Street, N. Y.

Our new Illustrated Catalogue and Price List is now ready, and will be sent to the Trade with their first order, or by express, if desired, before ordering.



WM. H. HASKELL, President.

E. S. MASON, Treasurer.

D. A. HUNT, Agent.

WM. H. HASKELL CO., MANUFACTURERS OF

GIMLET POINT

COACH SCREWS



Bolts, Cold-Punched Nuts & Washers,
SUITABLE FOR MACHINERY OF ALL KINDS.

Office and Work: 277 Main St., PAWTUCKET, R. I., U. S. A.

HENRY B. NEWHALL CO., Agents,

105 Chambers St., New York.

47 Pearl St., Boston.



CATALOGUES AND PRICE LISTS FREE ON APPLICATION.



The American Nail Machine Co., MANUFACTURERS OF

AMERICAN PATENT IMPROVED CUT NAIL MACHINES,

AUTOMATIC NAIL SELECTORS and NAIL
FACTORY SUPPLIES.

ASHTABULA, - - - OHIO.

Prices and particulars furnished on application.

TENSILE STRAIN, 56,000 to 64,000 lbs.
REDUCTION OF AREA—35 to 43 per cent



WM. McILVAIN & SONS, MANUFACTURERS OF

BOILER PLATE

AND
CHARCOAL BLOOMS.

Locomotive, Fire Box, Flange and Shell
Iron; Plate for Bridges and Girders; Tank
and Stack Iron; Boat Plate and Iron for
Wrought Pipe; Plate Iron for Fire and
Burglar Proof Safes.

Plates 1 1/4 inch thick to No. 14.
30 feet long.
70 inches wide.



Packer Ratchet.

These tools have been made by us for a number of years, and are well known as the leading Ratchet Drill in the market. They are manufactured of the best material and in a thorough manner. The screw is protected with a round sleeve, keeping dirt and grit from cutting the thread.

These Ratchets are made with Steel Screws, Paets and Hardened Points. Handles and Nuts are of Norway Iron, Paets and Ratchets of Steel, Forged, Solid and Milled Out.

EVERY TOOL IS WARRANTED.

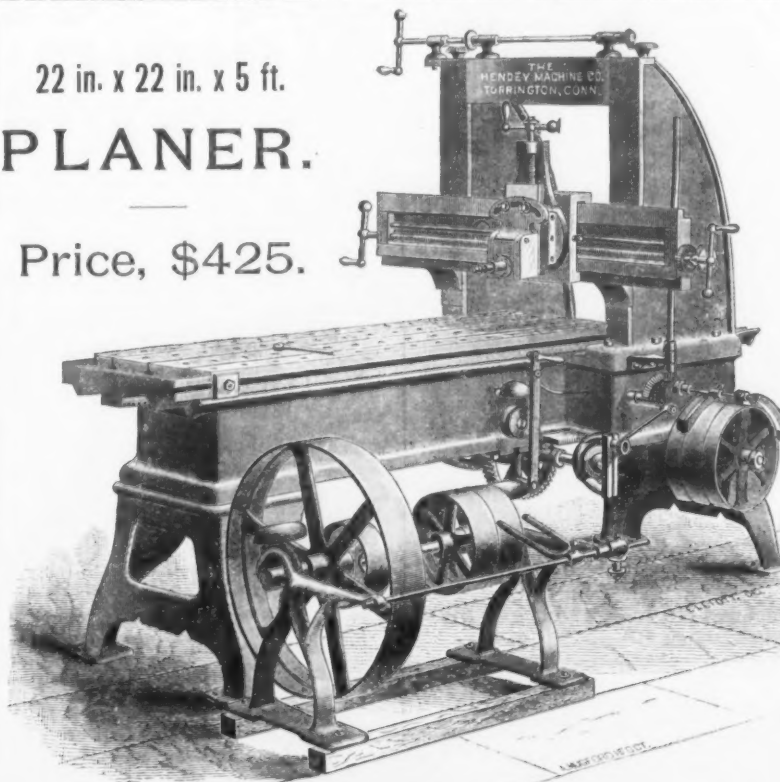
THE ASHCROFT MANFG. CO.,

Office and Salesroom, No. 117 Liberty St.

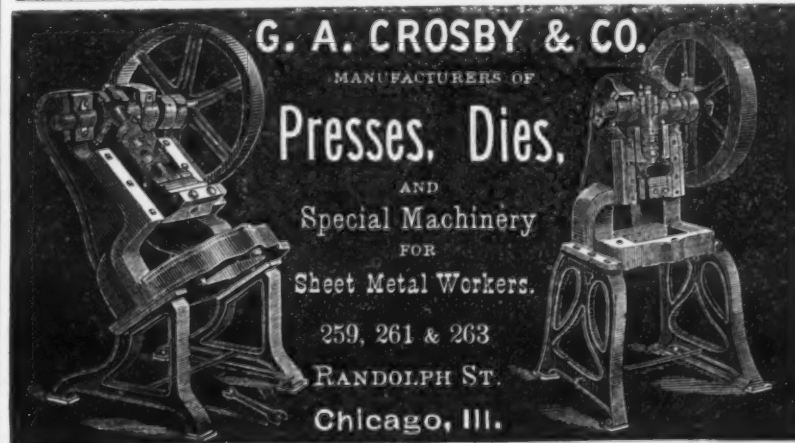
22 in. x 22 in. x 5 ft.

PLANER.

Price, \$425.



THE HENDEY MACHINE CO., TORRINGTON, CONN.



G. A. CROSBY & CO.

MANUFACTURERS OF

Presses, Dies,

AND

Special Machinery

FOR

Sheet Metal Workers.

259, 261 & 263

RANDOLPH ST.

Chicago, Ill.



W.H. CARTER'S PATENT NEEDLE HAY KNIFE.

PAT. APR. 29, 1884.

IMPROVED BY M.M. BARTLETT.

Improvement Patented April 29, 1885.

SOLE MANUFACTURERS OF
Carter's Improved

NEEDLE HAY KNIFE,

THE BEST IN
THE WORLD.

Improvement patented April 28, 1885, of which we are the sole manufacturers, has been tested with the most celebrated knives of other makers, and has proved an easier and faster Cutter than any other. Its special excellence consists in the chisel-edge tooth shown in the engraving. It may be used for cutting hay in the mow, stack and bale; also for ditching, cutting peat, or any other work for which a hay knife is used. It can be readily ground by the most inexperienced, as it requires to be ground only on one side. Should a tooth break, all that is necessary to replace the damage is to grind it once and a new chisel-tooth appears. It can ordinarily be sharpened with a common scythe stone. Try one and you will give it the preference.



Malmedie & Hiby,

DUSSELDORF- OBERBILK (Germany),

MANUFACTURERS OF

WIRE NAIL MACHINES

L. HERNSHEIM,

16 and 18 Exchange Place, New York,

Sole Agent for the United States and Canada.

THE BRUSH-SWAN ELECTRIC LIGHT CO.

W. L. STRONG, President. A. D. JULLIARD, Vice-President. G. McFALL, Secretary.

R. W. ABORN, Treasurer. JOHN B. POWELL, Gen'l Manager.

REMOVED to Nos. 204, 206, 208, 210 Elizabeth Street, New York,

Where Electric Apparatus for all the various modes of lighting and transmitting of Power are in operation. No other system is as economical in Installation and Maintenance. No other Electric Light is as durable—the first machines made are still in daily operation.

The System

Comprises

{ Arc Lights of various sizes

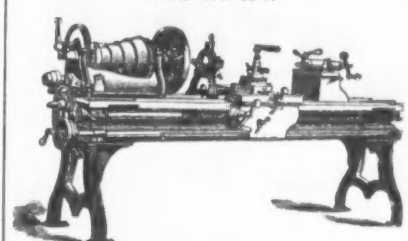
{ Arc and Incandescent Lights from one Dynamo and Circuit.

{ Incandescent Lights of various sizes from special Dynamo for Central Station Lighting.

Cost of Apparatus greatly reduced.

Surveys and Estimates by experts.

P. BLAISDELL & CO., Manufacturers of



MACHINISTS' TOOLS,

Blaisdell's Patent Upright Drills,

With Quick Return Motion.

Engine Lathes, Planers, Boring Mills,

Gear Cutters and Hand Lathes.

WORCESTER, MASS., U. S. A.

Send for new Catalogue of Specialties



ALFRED BOX & CO.,

312, 314, 316 Green St.,

PHILADELPHIA, PA.,

Manufacturers of

Box's Pat. Double

Screw Hoists.

13,000 in use.

Many have done hard,

continuous duty years

without a single part

being renewed. This is the

key of our success. They

have built up a reputation

themselves that cannot be

approached. Our improved

Radial Drills

are also assuming the same

standard.

G. E. BRETTELL,

Water Street, Rochester, N. Y.

Improved Planers a Specialty: 30 X 30, 22 X 22, 21 X 21

10 X 20, 30 X 30, 25 X 35, to plane

any desired length. Send for

Description and Prices before

purchasing.



HOWARD IRON WORKS, BUFFALO, N. Y.,

Manufacturers of

BOLT CUTTERS

AND NUT TAPPING MACHINES,

(Schlenker's Patent),

Send for Illustrated Catalogue.

PHENIX CHEMICAL WORKS,

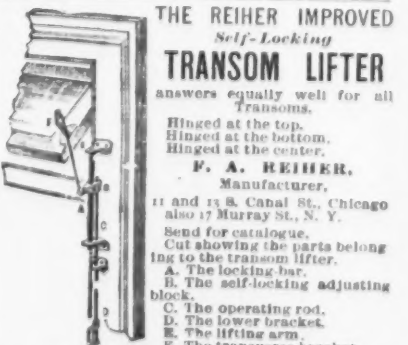
OIL OF VITRIOL,

Muriatic and Nitric Acids,

Aqua Fortis, &c.

GRIDLEY & CO., Agents,

87 Maiden Lane, New York.



THE REIHER IMPROVED

Self-Locking

TRANSOM LIFTER

answers equally well for all

transoms.

Hinged at the top.

Hinged at the bottom.

Hinged at the center.

F. A. REIHER,

Manufacturer,

11 and 13 Canal St., Chicago

also 17 Murray St., N. Y.

Send for catalogue.

Cut showing the parts belong-

ing to the transom lifter.

A. The locking bar.

B. The self-locking adjusting

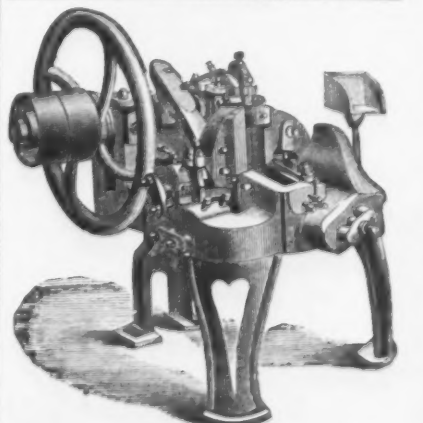
block.

C. The operating rod.

D. The lower bracket.

E. The lifeline arm.

F. The transverse bracket.



PITTSBURGH MFG. CO.,

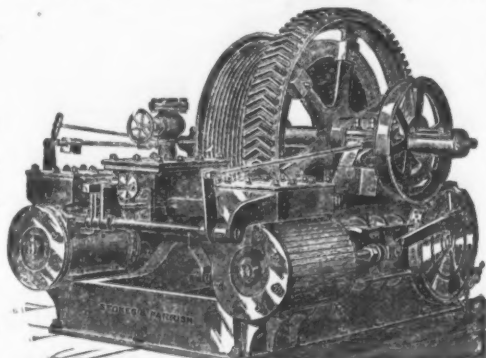
Manufacturers of Nail and Spike Machines, Bolts,
Nuts, Washers, Rivets, &c. Castings, Forgings and
Blacksmith Work promptly attended to.

Office and Works: Railroad St., near 28th, Pittsburgh, Pa.

STOKES & PARRISH MACHINE CO., Philadelphia,

ELEVATORS,

Passenger and
Freight, Steam,
Hydraulic and
Belt Power.

HOISTING
MACHINERY

For Mines, Dock
Use and Inclined
Planes.
All kinds of
Hoisting Machin-
ery a Specialty.

BLAST FURNACE HOISTING ENGINES,

With Vertical or Horizontal Cylinders for Handling Stock to Top of Stack
with One or Two Platforms.

Works and Office, 3001 CHESTNUT STREET, PHILA.

New York Office, 95 and 97 LIBERTY STREET.

E. W. BLISS CO.,

MANUFACTURERS OF

Presses and Dies and Special Machinery

For Working all Shapes and Classes
of Sheet Metal.

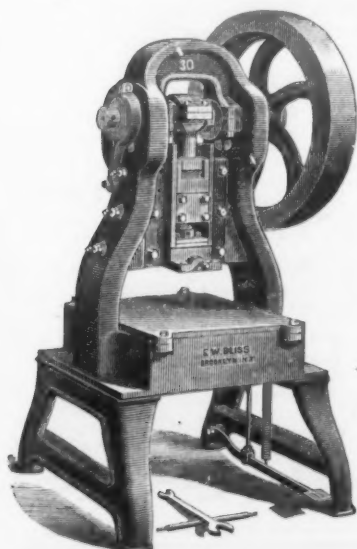
DOUBLE
SEAMING MACHINES

FOR
Round, Square and Oval Cans.

HAND AND POWER

Circular Shears.

Foot and Power
Squaring Shears.



WORKS OFFICE
Plymouth, Pearl and John Streets, 17 Adams Street,
BROOKLYN, N. Y.

PERRINE PATENT

Curved Blade HOE Double Shank

Manufactured only by the



CANTON HOE & TOOL CO.,
CANTON, OHIO, U. S. A.

WOOD WORKING MACHINERY

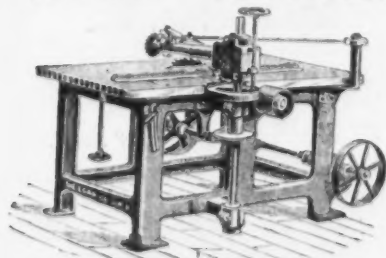
FOR

Planing Mills, Carpenters and Builders,
Furniture and Chair Factories, Car
and Agricultural Works, and
General Wood Workers.

MANUFACTURED BY

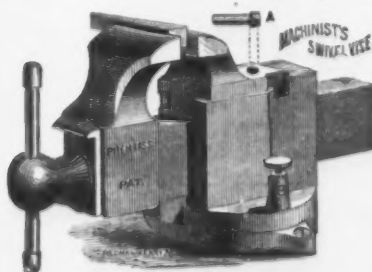
THE EGAN CO.,

Nos. 179 to 199 W. Front St.,
CINCINNATI, O., U. S. A.



SELF-FEEDING RIP SAW.
Feeds from 60 to 120 feet per minute. Best machine
of the kind made.

THOS. P. EGAN, Pres't. EDWIN RUTHVEN, Sec'y.
FREDERICK DANNER, Scr't.



PRENTISS' PATENT VISES,

ADJUSTABLE JAW,

Stationary or Pat. Swivel Bottoms,
Adapted to all Kinds of Vise Work, also

"PEERLESS" SWIVEL PIPE GRIP,
FITS ANY VISE. SOLD BY THE TRADE.

PRENTISS VISE CO.,

23 Day St., New York,

SOLE PROPRIETORS. SEND FOR CIRCULAR.



"REECE'S NEW SCREW PLATE"

BUTTERFIELD & CO.,

MANUFACTURERS,

Derby Line, Vt.

Send for Discounts.

William Barker & Co.,

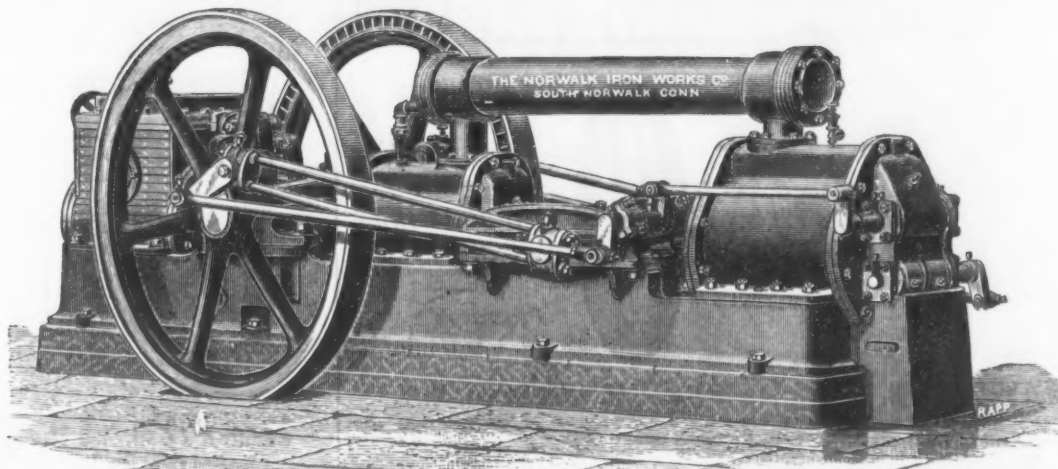
MANUFACTURERS OF

IRON & BRASS WORKING MACHINERY,

Nos. 140 and 142 E. SIXTH STREET, NEAR CULVERT, CINCINNATI, O.

SEND FOR CIRCULARS AND PRICES.

Air Compressors.



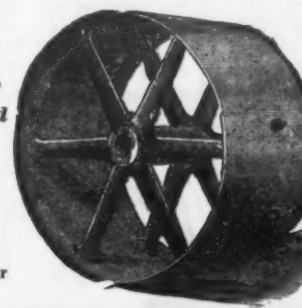
THE NORWALK IRON WORKS CO., South Norwalk, Conn.

WALKER MFG. CO.

SHAFTING,
HANGERS,
PULLEYS.

Pulley Castings and
Machine-Molded
GEARING
A SPECIALTY.
Cleveland, - Ohio.

Estimates furnished. Write for
Gear and Price Lists A.



ESTABLISHED IN 1874.

CLEVELAND TWIST DRILL CO.,

SEKLEY, CHURCH & CO., 315 California St., San Francisco.

24 and 26 West Street, Cleveland, O.
101 Chambers Street, New York.
85 Queen Victoria St., London, Eng.



Ludlow Valve Mfg. Co.,

OFFICE AND WORKS:

938 to 954 River St. & 67 to 83 Vail Ave., Troy, N. Y.

VALVES.

Double and Single Gate, 1/4 in. to 48 in.—outside and inside Screws, Indicator, &c.
for Gas, Water, Steam and Oil. Yard and Wash Hydrants. Send for Circular. Also

FIRE HYDRANTS.

Morse Twist Drill & Machine Co., NEW BEDFORD, MASS.,

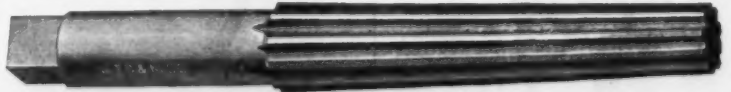
Manufacturers of Morse Pat. Straight-Lip Increase Twist Drills,



Bit Stock Drills, Solid and Shell Reamers, Drill Grinding Machines,

Milling Cutters,

Beach's Patent Self-Centering Chucks, and Special Tools to Order.



ALL TOOLS EXACT TO WHITWORTH STANDARD GAUGES.

MANNING, MAXWELL & MOORE,

Sole Sales Agents for THE MORSE TWIST DRILL AND MACHINE CO.'S



Manufacture of Patent Machine Relieved Nut, Hand,
Blacksmith and Machine Screw Taps, Screw Plates, Tap
Wrenches and Patent Relieved Pipe Taps and
Pipe Reamers; also of Solid Bolt and Pipe Dies.
Furnished in V. U. S. Standard and Whitworth
shape of threads.

111 Liberty Street, NEW YORK.



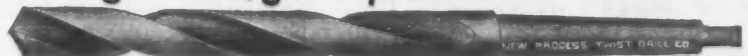
Blast Forge.

PECK'S PAT. DROP PRESS
BLAST FORGES
STEEL & IRON DROP FORGINGS
Drop Dies and Special Machinery.
BEECHER & PECK, NEW HAVEN CONN.

NEW PROCESS TWIST DRILL CO.,

MANUFACTURERS OF

Hot Forged Straight Lip Increase Twist Drills



Drills of an size or length, with Straight or Taper Shanks, made to order and to fit any socket desired.

SEND FOR CATALOGUE AND PRICE LIST.

TAUNTON, MASS.



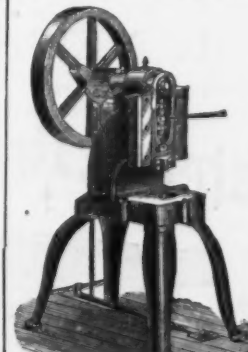
DEAD-STROKE POWER HAMMERS



DIENELT & EISENHARDT,

MAKERS,

1310 Howard St., Philadelphia.



A. H. MERRIMAN,
MERRIMAN, CONN.,
Manufacturer of all Descriptions of
PRESSES.
Catalogue and price sent on application.



Barnes' Pat. Upright Drills,
20-inch Swing, with both
Worm and Lever Feed.

Barnes' Patent Engine Lathe
18-inch swing, 6-foot or 8-foot
Bed. These machines are made a
specialty in our factory. They have
advantages not found in other ma-
chines in this line. It will pay
parties desiring to purchase, or
know more about this class of ma-
chines, to send for full description
and prices.
W. F. & JOHN BARNES,
19 Ruby St., Norwalk, Ill.

E. E. GARVIN & CO.

Manufacturers of Machinists' and Iron Workers'

Tools, Lathes, Planers, Milling Machines and Drills

Special Tools for all kinds of manufacturing to order.

At N. O. Exposition. (See cut.)

We received Gold Medal for our

NEW UNIVERSAL MILLER

139 to 143 Centre St., New York.



Gear and Rack Cutting, Milling and
Index Drilling to Order.

Machinery, &c.



Hydrostatic Machinery,

JACKS, PRESSES, PUNCHES, ACCUMULATORS, PUMPS, VALVES, FITTINGS, &c.

POLISHING AND BUFFING MACHINERY,
WOOD WHEELS, &c.,

Patent Punches and Shears.

WATSON & STILLMAN, 204, 206, 208 and 210 East 43d St.

LODGE, DAVIS & CO.,

MANUFACTURERS OF AND DEALERS IN

MACHINE TOOLS,

CINCINNATI, OHIO.

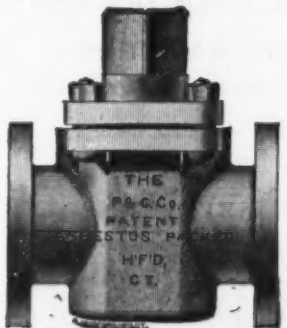
PLANERS, ENGINE LATHES, SHAPERS, FOX MONITORS, UPRIGHT DRILLS, SPEED LATHES, 20 in. to 32 in., VALVE MILLERS, MILLING MACHINES.

All for Immediate Delivery. Write for Prices before buying.

ASBESTOS PACKED STRAIGHTWAY COCKS

—FOR—
STEAM, GAS, AIR, AMMONIA, Etc.

The BEST Steam Valve Ever Produced.
TRY THEM.



As the plug comes in contact only with VULCANIZED ASBESTOS, it never cuts, grinds or sticks, as is the case with ordinary cocks. This Cock always opens and closes easily and remains absolutely TIGHT where all other Valves or Cocks will leak. They are recommended for Steam, Gas, Ammonia in all its forms, Chemicals, Boiler Blow-off, or where a vacuum is required, and ALL DIFFICULT places. The regular Cocks are guaranteed to stand a steam pressure of 300 pounds per square inch, but special goods are made and guaranteed to stand 2000 pounds per square inch. We also make Cocks to stand 1000 degrees of superheated steam, Gland End Cocks for Ice Machines and all other difficult places. Either Screw or Flange ends as required.

All Goods Warranted to Give Satisfaction.
SEND FOR DESCRIPTIVE CIRCULAR AND PRICE LIST.

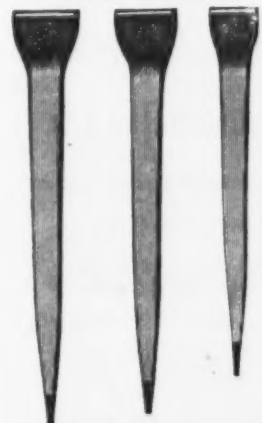
FAIRBANKS & CO.,

511 Broadway, New York. 216 Main St., Buffalo, N. Y. 302 Wood St., Pittsburgh, Pa.
17 Light St., Baltimore, Md. 382 Broadway, Albany, N. Y. 715 Chestnut St., Philadelphia, Pa.
FAIRBANKS, BROWN & CO., 88 Milk St., Boston, Mass.
AND THE TRADE GENERALLY.

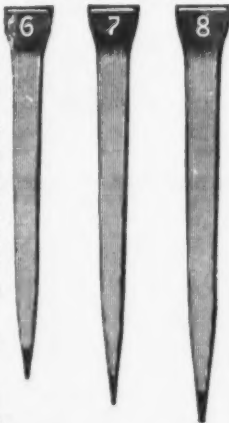
LARGE HEADS.

CHAMPION

CITY HEADS.



Horse Nails



Manufactured from very best SWEDISH METAL. Will not split. Are accurately pointed, tough, strong and hold the shoes. Soft enough to clinch readily; stiff enough to drive without bending. All nails uniform and perfect. They are used in thousands of shops with the best of satisfaction, and are especially liked by "floor-men" for their good, reliable driving. Made in two patterns, "LARGE HEADS" and "CITY HEADS."

QUALITY GUARANTEED.

LIST:
Nos. 4 5 6 7 8 9 10
50c. 28c. 25c. 23c. 22c. 21c. 20c.

CHAMPION HORSE NAIL CO., Appleton, Wis.

STEAM PUMPS
SEND FOR PRICES.
VALLEY MACHINE CO. EASTHAMPTON, MASS.

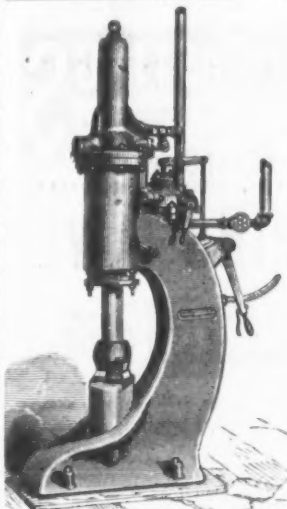
Machinery, &c.

William Sellers & Co.,

ENGINEERS AND MANUFACTURERS OF

IMPROVED MACHINE TOOLS

FOR WORKING IRON AND STEEL.



Steam Hammers, Bending Rolls, Riveting Machines, Punches and Shears, Drilling and Boring Machines, Lathes, Planers, Drill and Tool Grinders, Cranes, Turntables, &c., &c.

SHAFTING, PULLEYS, HANGERS, &c.,
FOR TRANSMITTING POWER.

IMPROVED INJECTORS
FOR FEEDING BOILERS.

OFFICE AND WORKS: PHILADELPHIA, PA.

SOUTHWARK FOUNDRY AND MACHINE CO.,

ENGINEERS AND MACHINISTS,

WASHINGTON AVE., and FIFTH ST., PHILADELPHIA, PA.

PORTER-ALLEN and SOUTHWARK ENGINES, BOILERS and TANKS, BLOWING ENGINES, BESSEMER CONVERTERS, GAS APPARATUS, SUGAR MACHINERY, HYDRAULIC MACHINERY, &c., &c.

MORSE ELEVATOR WORKS.

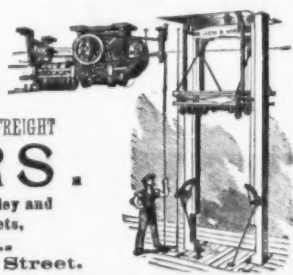
MORSE WILLIAMS & CO.

SUCCESSORS TO CLEM & MORSE.

Manufacturers and Builders of all kinds of PASSENGER and FREIGHT

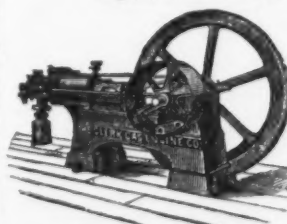
ELEVATORS.

OFFICE: 411 Cherry Street. Works: Frankford Ave., Wilder and Shackamaxon Streets, PHILADELPHIA. 108 Liberty Street. New York Office.



THE CLERK GAS ENGINE.

Highest Award for Gas Engines at American Institute Fair, New York, 1883.



Makes an ignition at every revolution of the Fly Wheel. Is started with ease, and gives full power immediately. No danger from fire; no extra insurance nor skilled engineer required. Runs perfectly steady; only uses gas when required. Workmanship of the best description and guaranteed. Indicated power considerably larger than in any other Gas Engine of the same size, each Engine giving from 1 H.P. to 4 H.P. more than named. Is unsurpassed by any other Gas Engine for running any kind of machinery or electric light, arc or incandescent. Has means for regulating to suit any coal or water gas.

No Boiler, Coal, Ashes or Engineer. Made in Sizes of 4, 8, 10, 15 and 25 H.P.
THE CLERK GAS ENGINE CO., 1012-1016 Filbert St., Philadelphia.
Branch Offices: 143 Chambers St., New York; 4 West 14th St., New York; 75 Dearborn St., Chicago.

Otto Gas Engine Works,

SCHLEICHER, SCHUMM & CO.

Thirty-third & Walnut Sts., Philadelphia. 130 Washington St., Chicago.

Over 18,000 ENGINES Consuming 25 to 75 ANY OTHER GAS ENGINE IN USE Per Cent. LESS GAS than PER HORSE-POWER.



TWIN ENGINES IMPULSE EVERY REVOLUTION.
The Steadiest running Gas Engine yet Made.

ENGINES AND PUMPS COMBINED
For Hydraulic Elevators, Town Water Supply, or Railway Service

SPECIAL ENGINES FOR ELECTRIC LIGHT WORK.

Unexcelled for running Elevators, Wood-Tools, Printing Presses, or any kind of Machinery. SIZES: 1 to 25 HORSE-POWER.

A few Good Second-hand Engines on Offer, taken in Exchange for larger sizes.

IRELAND MFG. CO., Cincinnati, Ohio,

SOLE MANUFACTURERS OF

THE MORRIS PAT. SASH LOCK, REVERSIBLE RABBETED MORTISE DOOR LOCK,

And THE MORRIS PAT. DOOR KNOB,

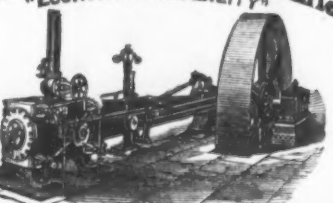
PATENT PENDING.

Also General Line of Builders' Hardware.

Catalogues and Lists Furnished on Application.

Machinery, &c.

CORLISS ENGINE BUILDERS



MACHINISTS IRON FOUNDERS BOILER MAKERS
ROBT WETHERILL & Co.
CHESTER, PA.

Stow Flexible Shaft Co., Limited,

2230 Pennsylvania Ave.,

PHILA., PA.,

Manufacturers of

PORTABLE DRILLING, TAPPING, REAMING & BORING MACHINES

Also Tools for Emery Wheels, Grinding, Metal and Wood Polishing, Cattle Brushing and Clipping, &c.

Gen'l European Agents,

Bolling & Lowe,

2 Lawrence

Pountney Hill,

LONDON, ENG.

PHILA. SHAFTING WORKS,

GEO. V. CRESSON,

18th & Hamilton Sts.

PHILA.

SHAFTING

A SPECIALTY

Manufacturers of

Shafting, Pulleys and

Hangers, Couplings

and every appurte-

nance used in the

Transmission of

Steam Power.

Established 1867.

E. Harrington, Son & Co.

Works and Office,

COR. N. 15th St. & Penn Ave.,

Phila., Pa., U. S. A.,

Manufacturers of a full line of

Iron-Working Machinery,

INCLUDING

Extension and Gap Lathes,

Planers with Quick Return,

Drills, &c., Hand Power Eleva-

tors with Patent Brake, Double

Chain Screw Hoists, Overhead

Tramway with Switch, Turn-

table and Geared Truck.

Gear Cutting a Specialty.

Send for estimates.

Represented by

J. Q. MAYNARD,

12 Cortlandt St., New York.

C. E. KIMBALL,

83 Oliver St., Boston, Mass.

WARREN BUCHNER,

102 Main St., Cincinnati, Ohio.

STODDARD LOCK & MAN'G CO.,

Saybrook, Conn.

THE PATENT

Cylinder Tumbler

LOCK

requires no screws or

nails to fix it on,

easiest applied of any

lock in the market,

and most difficult to

pick.

Sample Lock and

two Steel Keys nickel-

plated for 35 cts. in

stamps.

Mailed Free with

Trade List.



GLOBE IRON ROOF'G & PAINT CO.,

No. 20 Public Landing, Cincinnati, Ohio.

MANUFACTURERS OF THE

GLOBE STANDARD IRON ROOFING,

EXCELSIOR V-CRIMPED IRON ROOFING,

CORRUGATED IRON SIDING & CEILING,

Suitable for all kinds of buildings.

Send to us for descriptive circulars and prices be-

fore placing your orders.

ENGINES AND BOILERS OF ALL TYPES AND FOR EVERY SERVICE.

High Pressure Compound Condensing Engines for Factories and Mills.

The Dickson-Corliss Engine for Electric Lighting.

Hoisting Engines for Mines, Furnaces and Contractors.

HIGH PRESSURE BOILERS A SPECIAL FEATURE.

All Flanging and Riveting done by the most improved Hydraulic Machinery.

Hydraulic Flanged Heads for Boiler Makers.

For detailed information address

THE DICKSON MANUFACTURING CO.,

Scranton, Penn.

96 Lake St., Chicago, Ills.

112 Liberty St., New York.

TUBAL SMELTING WORKS

760 and 762 Broad Street - - PHILADELPHIA.

PAUL S. REEVES,

MANUFACTURER OF

Genuine Babbitt Metal

AND ALL GRADES OF

ANTI-FRICTION METALS.

ESTABLISHED:

Spring Making, 1842.

Steel Making, 1845.

Norway Iron, 1871 (Re-Rolled).

WM. & HARVEY ROWLAND,

MANUFACTURERS OF

Springs, Steel, Re-Rolled Norway
Iron & Slit Norway Nail Rods.

ADDRESS:

FRANKFORD P. O., PHILADELPHIA.

EAGLE FILE WORKS.

ESTABLISHED 1857.

Madden & Cockayne File Co.,

MANUFACTURERS OF THE OLD AND WELL-KNOWN

WHEELER MADDEN & CLEMSON"

BRAND OF

FILES.

Middletown, Orange Co.,

New York.

Buyers who appreciate the highest class of goods will do well to give this brand a trial.

EXTRA SUPERIOR CAST TOOL STEEL

LENG'S IMPROVED LEVER AND CAMGATE

QUICK OPENING VALVE

WELDLESS COLD DRAWN STEEL TUBES

JOHN S. LENG, 4 FLETCHER ST NEW YORK

PITTSBURGH STEEL CASTING CO.,

26TH AND RAILROAD STS., PITTSBURGH, PA.

MANUFACTURERS OF

Refined Bessemer Steel; Improved Steel Castings

UNDER HAINSWORTH'S PATENTS.

We are now prepared to fill orders for refined **BESSEMER BILLETS or BLOOMS** of any desired carbon and a uniform quality.

We would call attention of consumers to the fact that we use good material, and produce a steel pronounced by competent judges equal to the best English or German spring and soft steels.

Having had twelve years' experience in the making of **STEEL CASTINGS**, we are able to refer to our customers in all parts of the United States and Canada as to the quality of our work in this line. We make castings of steel practically free from blow-holes, as soft and easily worked as wrought iron, yet stiff, strong and durable, with a tensile strength of not less than 65,000 pounds to the square inch. In short, our castings unite the qualities of steel and wrought iron.

Wheels, Pinions, Cranks, Dies, Hammer Heads, Engines and Machinery Castings of all descriptions, Railroad Frogs and Crossings, Plowshares, Moldboards and Landslides.

Special attention given to Heavy Castings. We use no cast-iron in our Castings. Send for circular.

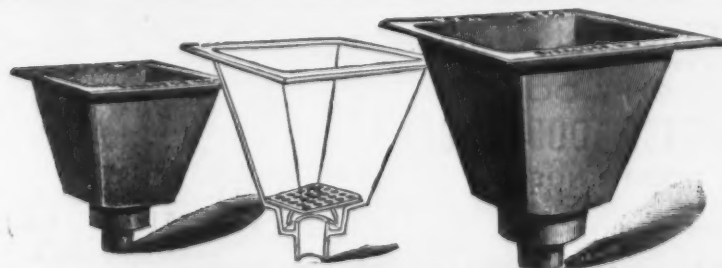
ROP HAMMERS.

Punching Presses. DIES AND OTHER TOOLS

FOR THE MANUFACTURE OF ALL KINDS OF SHEET METAL GOODS, DROP FORGINGS, &c.

Stiles & Parker Press Co., MIDDLETOWN CONN.

Branch Factory and Office, 203, 205 and 207 CENTRE STREET, NEW YORK.
SEELEY, CHURCH & CO., San Francisco, Cal., Sole Agents for Pacific Coast.



SLOP HOPPERS WITH BELL TRAPS.

MANUFACTURED BY

E. C. STEARNS & CO.,

SYRACUSE, N. Y.

Castings are of Smooth Gray Iron and Painted.

Size. Depth. List Price.

12 x 12 6 in. \$1.00

12 x 15 11 1/4 " 2.50

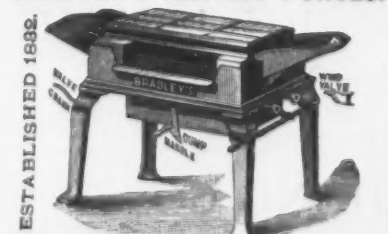
18 x 18 12 " 3.25

BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER



any other Hammer in the World.
BRADLEY & CO. Syracuse, N. Y.

BRADLEY'S HEATING FORGES.



ESTABLISHED 1882.
For Hard Coal or Coke. Indispensable in all shops to keep Bradley's Cushioned Hammers and Ben fully employed and reduces cost of production.
BRADLEY & CO. Syracuse, N. Y.

STANLEY G. FLAGG & CO.,

PHILADELPHIA, PA.

Office and Works,
N. W. Cor. 19th St. and Pennsylvania Ave

MANUFACTURERS OF

STEEL CASTINGS

A Substitute for Steel and Wrought Forgings.
Circulars Sent on Application.

STEEL CASTINGS

Railroad and Machine Castings,
1 lb. to 10 tons. Locomotive Cross
Heads and Gearing a Specialty

Eureka Cast Steel Co.,
307 Walnut St., PHILADELPHIA.

CRISPINS' AWL.



This is a hollow handle, with cap screwed on. It is made of hard wood, 5 inches in length, and weighs 4 ounces.

It contains inside a spool of waxed linen shoe thread of best quality and 50 feet in length.

The Spool is also hollow, and contains three Awhs and three Needles of various shapes and sizes. The thread fits the needles and the awls fit the chuck in the end of the handle and are held by the set screw, as seen in this cut.

This Tool is for repair work about the house, shop, farm or stable.

Being of suitable size and weight for carrying in the pocket, it can be used in the field or on the road to repair damages, when one use of it will ten amount to more than its whole cost.

It will sell at sight and give great satisfaction.

Dealers who buy goods on our recommendation may always return the first lot if they desire to, and at our cost. Price, per dozen, \$3, with usual trade discount.

MILLERS FALLS CO.,

74 CHAMBERS ST., NEW YORK.

Labor Saving Tools.



LIGHTNING & GREEN RIVER SCREW PLATES.

Bolt Cutters, hand and power. Drilling Machines, Punching Presses, Tire Benders, Tire Upsetters and other Labor Saving Tools. Send for Price List.

WILEY & RUSSELL MFG. CO., Greenfield, Mass.

COLUMBIA

Bicycles and Tricycles.

Highest Grade of Machines Made.

The Test of the Roads for 8 Years has not worn out a single COLUMBIA. Their Riders hold the best World's Records. — In majority at every League Meet. — Almost invariably Ridden by Long-Distance Tourists. — Every Part Interchangeable.

Catalogue Sent Free.

The POPE MFG. CO.,

267 Washington St., Boston.

Branch Houses: 19 Warren St., N. Y.; 115 Wabash Ave., Chicago.

"CLAYTON"

ROCK DRILLS

AIR COMPRESSORS

FOR CATALOGUES, ESTIMATES, Etc., Address,
Clayton Compressor Works,
MAYFIELD BRIDGE, BROOKLYN, N. Y.

OFFICE, 43 DEV STREET, NEW YORK.

A. G. PECK & CO.
Cohoes, N. Y.,
MANUFACTURERS OF

AXES, ADZES, BROAD AXES, HATCHETS.

Send for Catalogue and Price List.

THE Buffalo Steel Foundry,

BUFFALO, N. Y.

PRATT & LETCHWORTH, Proprs.

Orders and Correspondence Solicited.

SCRANTON BRASS & FILE WORKS.

J. M. EVERHART,

Manufacturer of

BRASS WORK

For Water, Gas and Steam.

Exhaust Steam Injector, using Waste Steam only, returning it to Boiler with water at 100 degrees.

Also PATENT CUT FILES.
Scranton, Pa.

RUSSELL, BURDSALL & WARD,

PORTCHESTER, N. Y.,

MANUFACTURERS OF

CARRIAGE, TIRE, BOLTS, FLOW, STOVE, &c.

Carriage Bolts made from Best Square Iron a Specialty.

F. W. WURSTER,
IRON FOUNDRY
AND AXLE WORKS,
130 to 142 First St.,
Brooklyn, N. Y.

AXLES

SUPERIOR
WAGON, CART AND
CARRIAGE AXLE.

Our facilities enable us to quote the trade lower prices than any other manufacturer. Send for price list.

Foot Power Scroll Saws, &c.

The Latest and Most Improved for the WORKSHOP OR AMATEUR.
Sold on trial, if desired. New Catalogue free.

SENECA FALLS MFG. CO.,
255 Water Street, Seneca Falls, N. Y.

SOLID STEEL CASTINGS,

FROM CRUCIBLE and OPEN HEARTH.

HYDRAULIC CYLINDERS AND GEARING SPECIALTIES.

CUN METAL ROLLS, PINIONS and CASTINGS.

AIR-FURNACE REFINED MALLEABLE CASTINGS.

All Stock used by us is subject to Chemical Analysis in our own Laboratory.

ISAAC C. JOHNSON & CO.,

Established 1853.

SPUYTEN DUYVIL, NEW YORK CITY.

STANDARD STEEL CASTING CO.
THURLOW, PA.
OPEN HEARTH AND CRUCIBLE
STEEL CASTINGS
QUALITY EQUAL TO STEEL FORGINGS

BEAUDRY'S UPRIGHT CUSHIONED POWER HAMMER.

By far the best. Most generally useful and durable. Blow accurate, powerful and elastic.

BEAUDRY & CUNNINGHAM
BOSTON, - - Mass.

STEEL BUTTER SPADE
Rust Proof,
Wood and Malleable Handles.

SAXTON & OSGOOD, HARDWARE SPECIALTIES.
21 and 23 LLOYD ST., BUFFALO, N. Y.
Write for Price Lists and Discounts.

GEM SPRING HINGES.

Prices Reduced.

NEW LIST, APRIL, 1886.

Japanned.

SINGLE ACTING.												
Inch.....	3 1/4	4	5	6	7	8	10	12				
Nos.....	63	64	65	66	67	68	69	70				
Per Pair...	\$0.70	0.90	1.10	1.40	1.75	2.50	3.50	4.50				

DOUBLE ACTING.												
Inch.....	3 1/4	4	5	6	7	8	10	12				
Nos.....	83	84	85	86	87	88	89	90				
Per Pair...	\$1.40	1.75	2.20	2.80	3.50	5.00	7.00	9.00				

Send for New Catalogue and Discounts.

VAN WAGONER & WILLIAMS CO.

82 Beekman Street, New York.

1886.

RD,

W,
t, &c.

ty.

AND
LE.

quote the
any other
ce list.



TH.

NGS.

CITY.

D.

le.

M

DE

dies.

IES.

S.

86.

12
70
4.50

12
90
9.00

nts.

0.